SAVANNA AND GLADE VEGETATION OF TURKEY MOUNTAIN, ARKANSAS

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by

Dr. Alan J. Rebertus
Assistant Professor, Principal Investigator

and

Sean Jenkins
Research Assistant

University of Missouri
The School of Natural Resources
1-30 Agriculture Bldg
Columbia, MO 65211

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SUMMARY

Two-hundred and forty plant species were identified in 18, 500-m^2 plots. Highest diversity was correlated with shallow, limestone glade sites; lowest diversity was correlated with deeper, acidic soils and plots with high total woody basal area. Species composition was associated with (1) shallow, basic soils (limestone glades); (2) deeper, acidic soils; (3) high woody basal area; and (4) shallow, acidic soils (sandstone glades). Along these primary gradients of soil depth and fertility, savanna flora tends to be found in intermediate areas, rather than extremes. Chert inclusions and colluvial processes also tend to blur community boundaries on Turkey Mountain.

Black hickory, post oak, eastern red cedar, and dwarf chinquapin oak are the dominant overstory species. The age structure of the overstory is multimodal, with hardwoods originating mainly c. 30, 50, and 80 yrs B.P.; and conifers around 60 yrs B.P.. Government Land Office Survey notes from c. 1830 indicate the area was dominated by white oak, post oak, black oak, hickory, with scattered shortleaf pine stands, but "true savanna," with widely spaced trees, was probably not widespread.

The understory strata are dominated by black jack oak, black hickory, post oak, and eastern red cedar. The encroachment of cedar (on more basic sites) and black jack oak and black hickory (on acidic sites) pose the most serious threat to glade and savanna flora.

High diversity of conservative flora persists on this site despite fire supression, but it should respond well to prescribed burning, especially enhancing the abundance of savanna forbs. Prescribed burns should be designed to (1) reduce fuel loads; (2) gradually reduce the basal area of black hickory, black jack oak, and eastern red cedar; and (3) promote vegetation "patchiness" (i.e., a mixtures of woodland, savanna, and glade flora elements) through large landscape burn units. Burning schedules, both return intervals and seasons, should strive to be somewhat variable (rather than uniform) to maintain tree recruitment and favor a variety of herbaceous reproductive strategies.

INTRODUCTION

In the Ozarks, savannas, glades, and open woodlands are distributed in a complex mosaic: sometimes they can be delimited but more often they are subtly integrated along continua relating to soil depth and bedrock type.

Savannas or "barrens" have widely scattered trees and extremely diverse groundcover vegetation which combines the floristic characteristics of both grasslands and woodlands (Nuzzo 1986). Fire and edaphic factors (especially shallow soils and pans) are primarily responsible for the openness of savannas. Only a few tree species thrive under those conditions: post oak, white oak, shortleaf pine, black oak, black jack oak, and black hickory are probably the most fire tolerant species in the Ozarks. With the exception of white oak, the same species are very drought tolerant. Currier (1991) reported 308 plant species in a chert-dolomitic savanna (and some glade) in Missouri. Savannas are among the most diverse communities in North America, but the physical and biotic determinants of floristic patterns are not well known.

Glades are treeless or sparsely wooded openings in forests, with bedrock at or near the surface (Logan 1992). They are often concentrated on, but not limited to, south and west aspects of hillsides, with savanna above and below. Several interacting factors probably promote shallower soils on these topographic positions, including lower productivity of vegetation (less litter and organic matter); drier, windier conditions conducive to litter export; more frost heaving; higher fire frequencies; and higher probability of erosion events on steep slopes. Certain bedrock types that are resistant to weathering also favor glade formation (reviewed in Logan 1992). Chinquapin oak, red cedar, and black jack oak are found where there are fissures or depressions in the bedrock. The herbaceous flora of glades is also highly diverse, with a mixture of glade endemics and prairie flora. Logan (1992) reported 193 species on 42 glades of the Buffalo River, Arkansas; and Ver Hoef et al. (1991) recorded 365 species in the vicinity of the Current River, Missouri.

Oak systems in Eastern North America have evolved under the influence of fire for thousands of years (Abrams 1992). There is growing evidence that many areas in the Ozarks were subject to frequent fires prior to European settlement (Guyette and Cutter 1991). Fire suppression in the last few decades has invoked many changes in the composition and structure of these communities. Savannas have become overgrown with black hickory, black jack oak, and a variety of fire-sensitive hardwoods (e.g., shadbush). Glades have become fragmented or closed in by eastern red cedar, black jack oak, winged elm, and winged sumac. The increased shade has dramatically reduced cover, abundance, and diversity of herbaceous species in both savannas and glades. Monitoring programs will aid in identifying sites and species that are most sensitive to fire suppression, and how they eventually respond to restoration.

The purpose of this study was to determine the current vegetation characteristics of Turkey Mountain, a remnant savanna-glade complex in the Ozark Mountains, Arkansas. Permanent plots were established for monitoring the effects of prescribed burning on the vegetation.

1. Determine vegetational gradients and their possible underlying environmental determinants by using Ordination.
2. Determine the fire history of the site and construct a fire probability based on Relative Age of Scarred Trees.

METHODS

Study Area

Turkey Mountain is located near the junction of the Buffalo and White rivers, Hathaway Wilderness Area, Buffalo River National Scenic Riverway. Geologically, it lies on the southern portion of the Springfield Plateau, sandwiched between the Salem Plateau to the north and Boston Mountains to the south and west. The stratigraphy is complex, consisting of various layers of Ordovician limestone and sandstone. The sandstone "caps" of Turkey Mountain appear to part of the massive St. Peter formation (Craig 1988, Craig and Deliz 1988). Above this sandstone layer are the Plattin, Kimmswick, and Fernvale limestones (Craig 1988, Craig and Deliz 1988, Logan 1992). The majority of limestone glades on mid-slope probably belong to dolomitic limestones of the Powell and Cotter formations.

Field Sampling

Eighteen 500-m^2 (20 by 25 m) plots (0.9 ha total) were established and permanently marked with rebar on Turkey Mountain and adjoining Granite Mountain (Fig. 1). Plots were located 100 m apart along transects running upslope. Transects were subjectively located with the purpose of covering representative vegetation, soil types, and slope aspects within the proposed burn unit (Table 1; see also Appendix 5).

Vegetation was surveyed in ~~late~~ June and again in early September. Some pre-vernal species may have already senesced by late June, but most species were probably detected in these two periods. Cover values between 0 and 5 (20% cover-scale increments) were assigned to all herbaceous and woody groundcover species (<1 m tall) in each plot. In addition, all trees ≥5 cm dbh (diameter at breast height) were tallied and dbh's recorded. Tree cores were taken at 0.4 m aboveground from c. 10 trees in each plot. Trees were subjectively chosen to demonstrate the range of ages for each species and past periods of recruitment. Saplings (2.5-4.999 cm dbh), large seedlings (>0.5 m tall; <2.5 cm dbh), and small seedlings (<0.5 m tall) were tallied in 100-m^2, 10-m^2, and 1-m^2 circular subplots, respectively. Two subplots of each size were randomly located in each main plot. The total area sampled for small seedlings, 36 m^2, was insufficient to provide good density estimates for most species; thus, these data should be interpreted with caution.

Soil depths were measured with a steel rod at 16 points located at 4-m intervals along the plot diagonals. Soil samples were taken from the upper 15 cm from each quarter of the plot. The two upper and two lower quarters were pooled separately. Samples were frozen for several months, sieved, and analyzed by the Soil Characterization Lab at the University of Missouri. In general, the within-plot variation in soil properties was very small, so only plot averages are presented in the results.

Data Preparation

Importance values were computed for trees and other woody regeneration:

Trees in each plot: $IV=((RBA + RD)/2)* 100$
Tree overall: $IV=((RBA + RD + RF)/3) * 100$
Regeneration in each plot: $IV=RWD * 100$
Regeneration overall: $IV=((RF + RWD)/ 2) * 100$

RBA is relative basal area (basal area of a species/total basal area)
RD is relative density (density of a species/total density)
RF is relative frequency (frequency of a species/total of all frequency values)
RWD is relative weighted density (weighted density of a species/weighted density for all species)

For woody regeneration, we used a weighted density that places greater importance on taller stems: saplings, large seedlings, and small seedlings were given weights of 1, 0.1 and 0.01, respectively.

Ordination and Cluster Analysis

Ordination is a technique which is used to objectively arrange either plots or species together based on their degree of similarity. For example, plots with similar species composition are placed close together in an ordination diagram; likewise, species that always occur together will be close together. Canonical Correspondence Analysis (CCA) is a special type of ordination that arranges plots and species based not only on compositional patterns, but also in relation to measured environmental variables. Thus, we can assess which species or plots are similar, as well as how they are correlated with environmental gradients such as soil moisture, salt pH, total basal area, etc....

CCA was done using the computer program CANOCO (Ter Braak 1988). Untransformed cover values were used for groundcover vegetation. Plot importance values (as computed above) were used for trees and woody regeneration. Rare species were down-weighted and scaling was symmetric; otherwise, all defaults of the program were used. Site variables used in the ordination included elevation and a slope-aspect scalar known as TRMI (topographic relative moisture index; Parker 1982). This index is lowest for steep, upper, convex, southwest-facing slopes; and highest for valley bottom or lower, northeast-facing slopes. It is an index of moisture availability that reflects solar radiation and water runoff/accumulation potential based on topography--it *does not* take into account soil type. Our ordination also examined vegetation gradients with respect to the following soil variables: salt (0.01 M $CaCl_2$) pH, cation exchange capacity (CEC), total bases, % organic matter, and % sand. In the analysis of herbaceous vegetation we also included total plot basal area and importance values for the 10 most common overstory species. Only the variables with the highest correlation with vegetation were included in the final analysis.

Cluster analysis has a slightly different objective than ordination: it defines discrete groups (of either plots or species) based on their similarity. Clusters are lumped together in hierarchical fashion, but various criteria can be used to decide how many clusters are "well-defined." Cluster analysis (Ward's Method, unless otherwise stated) was applied to data sets for soil characteristics (standardized data), groundcover species abundances, and overstory

importance values. SYSTAT (Wilkinson 1989) was used for all but the large groundcover data set, which was analyzed with SAS (1988).

A combination of ordination and cluster analysis was used to analyze floristic patterns on Turkey Mountain. There is some redundancy in using both, but it is reassuring when different techniques reveal the same patterns, or occasionally one will reveal something the other did not. In this study, for example, cluster analysis revealed some unique flora elements in plot 14 that were not easily distinguishable by ordination.

GLO Notes

Government Land Office survey notes were obtained from the State Land Survey Office in Little Rock, Arkansas, to assess presettlement vegetation and structure. We focused on a 2- to 3-section sweep immediately west and south of the White River from Hand Mountain to three miles south of the junction of White and Buffalo rivers, including Turkey Mountain and vicinity. Frequency and diameters of witness trees were recorded. In some cases, surveyors may have been biased in their selection of witness trees. Line descriptions provide additional evidence because their purpose was to describe the vegetation rather than mark boundaries. The surveyor also provided separate descriptions of "timber" and "undergrowth." We recorded the number of times each species was mentioned in line descriptions. Surveyors were usually instructed to list species in order of abundance; thus, we also calculated a weighted percentage of occurrence by assigning a value of "3" for trees listed first, "2" for trees listed second, "1" for trees listed third, and "0.5" for trees listed fourth or more.

RESULTS

Soil

Cluster analysis grouped plots 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, and 16 into one cluster; 1, 2, 7, 9, 17, and 18 into a second cluster; and plot 8 as an outlier. The first group represents plots with shallow (< 15 cm deep), basic (pH 6.45 to 7.30) soils with high CEC, bases, base saturation, and % clay (Table 1). The second group includes plots with acidic (pH 4.45 to 5.10) soils, with resultant lower base saturation, total bases, and CEC. Plot 8, on the flat summit of Turkey Mountain, is the deepest and has the greatest organic carbon content. There are scattered pockets of other limestone formations above the sandstone cap (see Study Area), which could explain the relatively high pH on plot 8.

The differences in the overall fertility of the two soils reflects the chemical composition of the parent material. The low fertility, acidic soils on Turkey Mountain are derived from base-depauperate sandstone and chert. Limestone (calcium carbonate) and dolomite (calcium magnesium carbonate) both have high concentrations of bases, which lead to high base saturation, CEC and pH. In addition, the Ordovician Age sedimentary limestones tend to have substantial 2:1 clay minerals, which tend to further increase CEC and base retention. All of the above factors promote high fertility, but the shallowness and resulting droughtiness of these soils may reduce nutrient availability during the growing season.

Vegetation

Overall diversity

A total of 240 species (154 genera, 62 families; 191 herbaceous/semi-woody and 49 woody species) were recorded in the 18 plots (Table 2). Scientific names follow Steyermark (1975). Some additional species were collected off the plots and will be incorporated into a site plant list. An exhaustive collecting effort would yield more than 300 species, particularly if the area was sampled over the entire growing season and a second year. Richness and diversity (Shannon-Weaver Index) were highest on the limestone glade plots (Fig. 2). Low diversity was correlated with acid soils and high basal area (closed canopy). Relatively low diversity was also correlated with high importance values of black jack oak (also on acidic soil), where thickets were heavily shaded as well.

Overstory

There were 26 tree and tall shrub species (≥5 cm dbh) present on Turkey Mountain, with black hickory, eastern red cedar, post oak, and chinquapin oak having the highest importance values (Table 3). Black hickory had the highest relative frequency and density; eastern red cedar had the highest overall basal area--despite its presence in less than half of the plots. Appendices 1-3 present density, basal area, and importance values by plot.

The age structures of hardwood species on Turkey Mountain are distinctly multimodal, with distinct cohorts establishing roughly 30, 50, and 80 yrs B.P. (Fig. 3). The area was burned almost annually during the 1950's (Guyette 1994). The major regeneration cohort (20-35 years old) corresponds well with the cessation of frequent burning: in particular, after extensive burns that occurred in 1960 and 1963. The oldest post oak was 188 years old, but most of the large trees were hollow and could not be dated. Some of the chinquapin oaks and black hickories were also very old (>150 and >130 yrs old, respectively, but probably much older). Several American smoke trees cored were >100 years old (117 years maximum). The majority of eastern red cedar and shortleaf pine trees found on the lower slopes established 50-65 yrs B.P., which, surprisingly, was a period when the mountain was burned relatively frequently, although the extent of the burns is unknown (Guyette 1994). We suspect a major fire in the 1920s may have exposed mineral soil and favored conifer establishment. It should be cautioned that this was not a random sample of tree ages and that coverage was fairly limited. Also, <50% of the cores were sound enough to estimate complete ages.

Tree compositional patterns were strongly related to environmental variables, particularly pH, soil depth, total bases, and elevation (Table 4). Plot 18 was the most distinct, characterized by pine and sassafras on deeper soil with low pH, CEC, and total bases (Fig. 4). Plots 1, 2, 7, 9, and 17 were also on deeper, more acid soils overlying sandstone or chert; with indicator species such as black jack oak, black locust, southern red oak, white oak, and black oak. White oak is probably restricted more by soil depth than pH. The rest of the plots were on shallow soils overlying limestone. Indicator species included typical calcicoles: blue ash, eastern red cedar, bumelia, dwarf chinquapin oak, and American smoke

tree. Chinquapin oak importance values were also highly correlated with magnesium levels. Post oak, persimmon, and red oak displayed the greatest tolerance, but were slightly more abundant on the more basic soils.

Shrub and Tree Regeneration Strata

The understory was dominated by black jack oak, black hickory, post oak, and eastern red cedar (Table 3). Black jack oak and black hickory pose the greatest threat to sandstone glade and savanna vegetation; their abundance was clearly correlated with lower groundcover diversity. Besides black jack oak, Reiter (1991) identified winged elm, winged sumac, and aromatic sumac as troublesome invaders of glades in southern Missouri. Both winged elm and aromatic sumac are relatively abundant on Turkey Mountain. Savanna species, like post oak, are still reasonably abundant as regeneration. Appendix 4 gives densities of saplings and seedlings by plot.

The understory composition was also strongly related to environmental variables, especially pH, total bases, CEC, and % organic C (Table 4). The same dichotomy in floristics observed for trees was also apparent in the understory. Plots on deeper and/or acid soils (1, 2, 7, 9, 17, and 18) were floristically distinct, with fringe tree, winged sumac, black oak, white oak, sassafras, and black jack oak being the main indicators (Fig. 5). The other plots, on basic soils, were characterized by the same calcicoles listed above, as well as winged elm, southern rusty blackhaw, and rough-leaf dogwood. Persimmon, post oak, and shadbush displayed wide tolerance.

Groundcover

Although the species data was somewhat more variable than the tree and understory data considerable variation was accounted for by the combined species-environmental data (Table 4). The composition was highly correlated with pH, soil depth, % sand, and the importance value for black jack oak. The groundcover tracked the overstory and woody understory composition fairly well, with a few exceptions (Fig. 6A-C). Plots 2, 7, 9, and 17--all on acid soils---were floristically similar. Characteristic species include *Desmodium pauciflora* (a tick trefoil), several sedges and nut sedges (*Carex muhlenbergia, C. retroflexa, Cyperus filiculmis*), several grasses (*Sphenobolis intermedia, Elymus virginicus, Sporobolus asper, Aristida dichotoma, Panicum linearifolium*), lamb's quarters, hairy lip fern, dwarf dandelion, purple cudweed, butterfly pea, pellitory, St. Andrew's cross, spiderwort, forked chickweed, the bedstraw *Galium aparine*, common ragweed, a sunflower *Helianthus hirsutus*, a rushfoil *Crotonopsis linearis*, a goldenrod *Solidago petiolaris*, and others (Fig. 6A-C).

Plots 7 and 9 are partly on sandstone glade (soil depth ranges from 0 cm on the exposed bedrock ledge to 0.5-0.8 m further upslope). Indicator species on these shallow, acidic soils include hairy lip fern, stonecrop, *Crotonopsis linearis, Helianthus hirsutus*, butterfly pea, *Cyperus filiculmis, Bromus racemosa*, and forked chickweed. Some of these may be found on cherty soils as well (cluster analysis grouped the sandstone glade flora with other calcifuge flora).

Plots 1, 8, and 18 were floristically distinct and correlated with high basal area (closed woodland canopy) and soils with low sand (high silt) content. These plots were characterized by low species richness. Indicator species included *Vaccinium* species and wild yam; plus many shade-tolerant woodland, herbs like *Viola triloba*, wood anemone, grape, alum root, and wild bergamot.

Most of the plots on basic soils grouped very closely together, floristically (3, 4, 5, 6, 10, 11, 12, 13, 14, 16). Characteristic species for these plots include ~~*Petalostemon*~~ *purpureum*, *Kuhnia eupatorioides*, *Houstonia nigricans*, *H. tenuifolia*, *Acacia angustissima*, *Desmodium sessifolium*, *D. illinoense*, *Sisyrhinchium campestre*, *Senecio obovatus*, *Coreopsis palmata*, *Bouteloua curitipendula*, *Talinum calycinum*, *Celtis tenuifolia*, and many others.

Clustering criteria (*Pseudo F* and *t* statistics of SAS PROC CLUSTER) confirmed the presence of only 2 or 3 floristically distinct groups. The average linkage method grouped plots 1, 2, 7, 8, 9, 12, 13, 15, 16, 17, and 18 into one group and plots 3, 4, 5, 6, 10, and 11 into another. Plot 14 was an outlier. Wards method produced nearly identical results, with the exception that plot 14 was included in the first cluster (8, 18, etc...). Physiographically, plot 14 is the most mesic site (lower slope, north aspect) and it has some distinct species: *Panicum laxiflorum*, wild yam, *Agrimonia rostellata*, black snakeroot, lyre-leaved sage, a morning glory species, a crown beard, and others (see Table 2).

Subsurface chert and colluvial processes on the steep slopes probably blur some of the floristic gradients on Turkey Mountain. A more complete, regional synthesis of glade vegetation of the areas can be found in Logan (1992).

Presettlement Vegetation

The presettlement upland vegetation in the vicinity of Turkey Mountain was dominated by white oak, post oak, black oak, hickories, and shortleaf pine (Table 5). We suspect that the surveyor may have grouped all red-oak group species together as "black oak," because black oak is listed in some lowland areas (see below).

Evidently, the area lacked extensive pineries in 1830: they were uncommon as witness trees (particularly north of Turkey Mountain) and mentioned in only about half of the line descriptions. Eleven percent of the line descriptions listed pine first, suggesting there were some large stands. Cedar was mentioned in some lines, but apparently was much less common than it is today.

The understory was dominated by oak, although the surveyor did not specify which species. Interestingly, briers (*Smilax*) were very abundant in 1830--as they are today. Fire sensitive species like pawpaw, redbud, and dogwood were occasionally mentioned; however, they may have been restricted to draws.

Although xeric oak species dominated this area in 1830, the distances to witness trees suggest that most of the area was not "savanna" in the classical sense of widely scattered trees. There are some exceptional areas recorded near Turkey Mountain, however. For example,

at the corner of sections 27, 28, 33, and 34 (T 18 N, R 14 W) just above Hathaway Hollow on Warrior Creek Mountain, the average distance to three witness trees was 81.5 feet, and a fourth witness tree in section 28 could not be "conveniently" found.

The most frequently listed "lowland" species (in order of abundance as witness trees) were ash, boxelder, white oak, black oak, overcup oak, sugar maple, black walnut, elm, and sycamore. Again, the "black oaks" may have been any species in the red oak group. The lowland understory was dominated by oaks, pawpaw, cane, spicewood [spicebush], briers, grape, and dogwood.

MANAGEMENT RECOMMENDATIONS

Turkey Mountain has retained very high species richness and should respond well to burning. Relict savanna vegetation and open-grown oaks can be found in woodlands on the mountain, suggesting these areas were previously savanna-like and could be restored. Burning will promote higher species diversity (or at least greater abundance of conservative taxa, especially savanna forbs) by reducing the cover of black hickory and black jack oak on upper slopes, and eastern red cedar on limestone glades of the middle and lower slopes. The following are some other specific recommendations:

(1) Burning schedules should be variable enough to allow periodic recruitment of oaks and pines. This could be accomplished either temporally (occasional 5- to 10-year fire-free intervals) or spatially (patchy burns or different burn units).

(2) Uniform seasonal schedules may favor a certain *subset* of species or flowering phenologies in ways that are not well understood (Robbins and Myers 1989). Strive to capture some variation in season of burn: over a two-month span in early spring, for example, with an occasional fall burn if compatible with other uses.

(3) Initial burns should be designed to reduce fuel loads and gradually kill back some undesirable hardwood regeneration. Cedar (and hardwoods) should not be pre-cut before burning. Slash burns explosively and results in severe loss of soil organic matter. Soil erosion could be serious on glades of steep upper to mid-slopes, where there is reduced retention time (low infiltration, high lateral flow and surface runoff). Therefore, the first prescribed burns should be conducted during moderate burning conditions to reduce fire intensity. Backfire the upper slopes and summits of Turkey mountain during initial burns, for saftey, and to reduce the chance of timber damage and erosion.

(4) The area to be managed should be large and encompass as much geomorphic variation as possible. Landscape-scale burn units will result in considerable burn patchiness, but this will be essential for maintaining hardwood recruitment and fostering a mixture of glade, savanna, and woodland flora elements.

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Table 1. Site and soil characteristics of Turkey Mountain (TM) and Prince Fred's Knob (PFK), Ozark National Scenic Riverways, Arkansas.

Plot	Slope Pos.	Substrate	Dominant Vegetation	Elev. (ft.)	Aspect (°)	Slope (°)	Moisture Index 0=dry	Soil Depth (cm ± SD)	Sand (%)	Silt (%)	Clay (%)	Text. Class
1 (TM)	upper	chert/sandstone	black oak-blk hickory	1020	150 SE	22	19	5.90 ± 2.6	26.25	64.35	9.45	SIL
2 (TM)	mid	chert	blackjack oak-blk hickory	830	176 S	26	15	14.10 ± 9.3	78.35	15.65	6.05	FSL/LS
3 (TM)	lower	limestone	post oak, gladey	660	179 S	18	24	10.80 ± 8.3	73.00	11.80	15.15	FSL
4 (TM)	upper	limestone	chinquapin oak, gladey	860	170 S	20	21	2.90 ± 4.6	79.60	8.00	12.40	FSL
5 (TM)	mid	limestone	chinquapin oak, gladey	700	175 S	19	19	7.90 ± 7.5	79.15	8.30	12.55	FSL
6 (TM)	lower	limestone	red cedar	605	185 S	19	26	4.40 ± 3.7	65.15	13.50	21.35	FSL/SCL
7 (TM)	ridge	sandstone	blk hickory-blackjack oak, gladey	903	115 E	8	20	30.40 ± 24.9	79.40	12.65	7.95	LFS/FSL
8 (TM)	ridge	sandstone	blk hickory	990	82 E	8	23	13.60 ± 7.6	31.20	49.50	19.30	S/L
9 (TM)	ridge	sandstone	blackjack and post oak	930	230 SW	4	11	18.40 ± 12.8	80.20	11.20	8.60	LFS
10 (TM)	saddle	limestone/sand-stone colluvium	blk hickory, chinquapin oak, open glade	876	115 E	8	23	5.00 ± 6.5	83.95	5.35	10.70	LS
11 (TM)	lower	limestone	red cedar	569	125 ESE	11	36	15.90 ± 16.1	74.70	10.30	15.00	FSL
12 (TM)	upper	limestone	post and red oak	819	290 WNW	21	23	8.30 ± 8.3	52.55	19.90	27.50	SCL
13 (TM)	upper	limestone	post oak	864	242 WSW	20	15	4.20 ± 3.8	70.90	13.40	15.70	MSL
14 (PFK)	lower	limestone	blk hickory-red cedar	645	20 NNE	12	46	13.40 ± 16.1	72.00	12.55	15.45	FSL
15 (PFK)	mid	limestone	red cedar, gladey	714	325 NW	12	32	9.80 ± 12.2	48.90	21.40	29.75	SCL
16 (PFK)	upper	limestone	chinquapin oak, gladey	822	331 NW	18	25	5.40 ± 5.4	66.70	12.15	21.15	SCL/MSL
17 (PFK)	ridge	chert/sandstone	white and s. red oak	945	349 NW	4	30	40.10 ± 9.7	79.00	18.15	2.85	LS
18 (TM)	hollow	chert	shortleaf pine	510	163 SSE	24	26	22.10 ± 7.8	49.10	45.45	5.50	FSL

Table 1 (continued).

Plot	pH	CEC	Total Bases	Ca	Mg	Na	K	Neutralizable Acidity	Base Saturation	Al Saturation	Organic C (%)
		meq/100 g							(%)		
1	5.10	10.45	7.45	6.25	1.00	trace	0.20	6.95	71.5	---	2.60
2	5.00	5.90	4.35	3.05	1.15	0.10	0.05	3.45	74.0	---	1.75
3	6.75	14.65	16.70	14.35	2.15	trace	0.20	2.80	100.0	---	1.85
4	7.30	11.45	16.50	14.00	2.15	0.10	0.25	1.85	100.0	---	1.45
5	6.90	13.00	14.35	9.30	4.60	0.10	0.30	2.80	100.0	---	1.85
6	6.85	22.65	25.95	23.55	1.75	0.20	0.45	3.60	100.0	---	3.85
7	5.00	8.40	4.75	4.05	0.60	trace	0.10	6.55	61.0	3.5	1.60
8	6.05	36.25	32.40	29.85	1.95	trace	0.60	11.45	90.0	---	6.00
9	4.85	8.70	5.45	4.70	0.60	trace	0.15	6.25	62.0	2.0	1.35
10	6.60	10.10	9.45	6.85	2.50	trace	0.15	2.10	94.0	---	1.75
11	6.75	16.50	17.55	32.30	1.00	0.10	0.35	3.45	96.5	---	2.55
12	6.45	28.35	25.85	22.85	2.40	0.10	0.50	6.75	92.0	---	4.50
13	6.45	15.40	15.20	10.6	4.25	0.10	0.25	3.90	98.0	---	2.50
14	6.55	18.15	17.90	16.40	1.20	0.10	0.25	4.30	91.0	---	2.95
15	7.15	32.10	41.80	35.75	6.20	trace	0.45	4.30	100.0	---	5.40
16	6.85	19.30	20.95	14.45	6.25	trace	0.25	3.85	100.0	---	3.00
17	4.60	3.10	2.00	1.1	0.80	trace	0.10	2.75	64.5	7.0	0.70
18	4.45	6.90	3.05	2.1	0.80	0.10	0.10	3.75	43.5	15.0	1.80

Table 2. Plant species list for Turkey Mountain. Cover values are for groundcover. Presence above the groundcover layer indicated by "a" (abundant) or "p" (present).

		Acidic Soils						Basic Soils										
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Ophioglossaceae																			
Botrychium dissectum Spreng.	grape fern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Polypodiaceae																			
Asplenium platyneuron (L.) Oakes.	ebony spleenwort	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Pellaea atropurpurea (L.) Link	purple cliff-brake	0	0	0	0	0	0	1	1	0	3	0	2	2	1	1	2	2	2
Cheilanthes lanosa (Michx.) D.C. Eaton	hairy lip-fern	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinaceae																			
Pinus echinata Mill.	shortleaf pine	p	0	0	0	0	a	0	0	0	0	0	0	0	0	0	0	0	p
Cupressaceae																			
Juniperus virginiana L.	eastern red cedar	0	0	p	a	0	0	0	0	a	a	0	0	a	0	0	a	a	p
Juniperus ashei Buchholz	Ashe's juniper	0	0	0	0	0	0	0	0	0	0	0	0	a	0	0	0	0	0
Poaceae																			
Bromus purgans L.	brome	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	1
Bromus racemosus L.		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca obtusa Biehler.	fescue	0	0	0	1	0	0	0	2	3	1	0	2	0	1	0	1	0	2
Festuca octoflora Walt.		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis spectabilis (Push) Steud.	lovegrass	0	1	0	2	0	0	3	2	0	0	0	0	0	0	0	0	0	0
Melica nitens Nutt.	melic grass	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tridens flavus (L.) Hitchc.	purpletop	0	0	0	3	0	0	2	2	3	3	0	3	4	0	2	2	2	0
Elymus canadensis L.	wild rye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Elymus virginicus L.		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphenobolis obtusata (Michx.) Scribn.	wedge grass	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphenobolis intermedia Rydb.		0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Danthonia spicata (L.) Beauv.	wild oat grass	0	0	0	1	0	1	0	0	0	0	0	0	2	1	0	1	3	0
Danthonia sericea Nutt.		0	0	0	0	0	0	0	3	5	4	0	3	0	0	0	0	0	2
Muhlenbergia capillaris (Lam.) Trin.	muhly	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muhlenbergia sobolifera (Muhl.) Trin.		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Sporobolus asper (Michx.) Kunth.	dropseed	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sporobolus clandestinus (Biehler) Hitchc.		0	1	0	0	0	0	2	3	0	3	0	3	5	0	0	0	1	0
Aristida dichotoma Michx.	three-awn	0	0	2	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Aristida oligantha Michx.		0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Aristida purpurascens Poir.		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Bouteloua curtipendula (Michx.) Torr.	side-oats grama	0	0	0	0	0	0	2	3	2	0	0	0	3	0	0	0	1	0
Panicum virgatum L.	switchgrass	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	4	0
Panicum linearifolium Scribn.	panic grass	0	2	4	0	2	0	2	0	0	0	0	0	0	0	1	1	0	1

Table 2. (cont.)

		Acidic Soils						Basic Soils											
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Panicum laxiflorum Lam.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Panicum lanuginosum Ell.		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Panicum clandestinum L.		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Panicum latifolium L.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Panicum boscii Poir.		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0
Panicum oligosanthes Schult.		1	0	1	1	0	0	0	0	0	0	1	2	3	0	0	0	0	0
Panicum sp. L.	unidentified	0	0	0	0	0	0	0	2	3	2	0	0	0	0	0	0	0	0
Andropogon scoparius Michx.= *Schizachyrium*	little bluestem	0	2	3	3	0	0	3	3	4	3	0	4	4	1	0	0	2	3
Andropogon gerardi Vitm.	big bluestem	0	1	2	0	0	0	4	4	4	5	0	4	2	0	1	0	3	1
Sorghastrum nutans (L.) Nash.	Indian grass	0	2	0	3	0	0	3	3	4	3	0	3	3	0	0	0	0	3
Cyperaceae																			
Cyperus filiculmis Vahl.	nut sedge	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scleria oligantha Michx.	nut rush	0	0	0	0	0	0	3	0	0	1	0	0	1	0	3	2	5	0
Carex cephalophora Muhl.	sedge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Carex muhlenbergii Schk.		1	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
Carex retroflexa Muhl.		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex arctitecta =*Carex nigromarginata* var. *muhlenbergii* (Gray) Gl.		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Carex lanuginosa Michx.		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex sp. L.	unknown sedge	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commelinaceae																			
Tradescantia ohiensis Raf.	spiderwort	0	1	5	5	0	0	0	0	2	0	0	1	0	0	0	0	0	0
Commelina erecta L.	day flower	0	0	0	1	0	0	1	1	1	2	1	0	2	0	0	0	0	0
Liliaceae																			
Allium stellatum Fraser	wild onion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
Smilax bona-nox L.	greenbrier	0	1	3	0	0	1	5	5	5	4	0	3	3	2	1	5	2	2
Dioscoreaceae																			
Dioscorea quaternata (Walt.) J.F. Gmel.	yam	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0	1
Amaryllidaceae																			
Agave virginica L.	American aloe	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3
Iridaceae																			
Sisyrhinchium campestre Bickn.	blue-eyed grass	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1
Orchidaceae																			
Spiranthes gracilis (Bigel.) Beck	slender ladies' tresses	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. (cont.)

		Acidic Soils						Basic Soils										
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Arenaria patula Michx.	sandwort	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Silene virginica L.	fire pink	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ranunculaceae																			
Delphinium carolinianum Walt.	Carolina larkspur	0	0	1	2	0	0	2	3	2	1	0	1	0	0	1	0	0	0
Anemone virginiana L.	thimbleweed	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0
Lauraceae																			
Sassafras albidum (Nutt.) Nees	sassafras	5	p	p	0	a	a	0	0	0	0	0	0	0	0	0	0	0	0
Cruciferae																			
Lepidium virginicum L.	pepper grass	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis canadensis L.	sicklepod	0	1	0	1	0	0	1	2	2	2	0	1	0	0	1	1	1	0
Arabidposis thaliana (L.) Heyn.	mouse-ear cress	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae																			
Sedum nuttallianum Raf.	stonecrop	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sedum pulchellum Michx.	widow's cross	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Saxifragaceae																			
Heuchera americana L.	alum root	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1
Rosaceae																			
Amelanchier arborea (Michx. f.) Fern.	shadbush	p	p	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	p
Crataegus sp. L.	hawthorn	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0
Rubus sp. L.	bramble	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Agrimonia rostellata Wallr.	agrimony	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Agrimonia pubescens Wallr.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Rosa carolina L.	pasture rose	0	0	0	1	1	0	3	0	0	1	1	1	2	1	1	0	1	2
Prunus sp. L.	plum	1	1	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0
Leguminosae																			
Acacia angustissima (Mill.) Ktze. var. *hirta* (Nutt.) Robinson	acacia	0	0	0	0	0	0	4	2	2	2	0	2	5	0	2	0	0	0
Schrankia uncinata Wild.	sensitive brier	0	0	0	0	0	0	3	0	1	0	0	1	0	1	1	0	0	1
Cassia fasciculata Michx.	partridge pea	0	0	3	2	0	0	1	4	3	0	0	2	0	0	0	0	0	0
Baptisia leucophaea Nutt.	long-bracted wild indigo	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Petalostemon candidum (Willd.) Michx.	white prairie clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Petalostemon purpureum (Vent.) Rydb.	purple prairie clover	0	0	0	0	0	0	1	2	1	2	0	1	1	0	2	0	0	2
Tephrosia virginiana (L.) Pers.	goat's rue	1	4	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Robinia pseudo-acacia L.	black locust	0	0	a	p	0	0	0	0	0	0	p	0	0	p	p	0	0	0

Table 2. (cont.)

		Acidic Soils						Basic Soils										
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Astragalus canadensis L.	rattle weed	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Desmodium glutinosum (Muhl.) Wood	tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Desmodium pauciflorum (Nutt.) DC.		2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Desmodium illinoense Gray		0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0
Desmodium laevigatum (Nutt.) DC.		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0
Desmodium sessilifolium (Torr.) T. & G.		0	0	0	0	0	0	3	1	3	2	0	1	2	0	0	3	0	0
Desmodium cuspidatum (Muhl.) Loud.		0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0
Desmodium nuttalli (Schindl.) Schub.		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Desmodium paniculatum (L.) DC.		0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0
Desmodium sp. Desv.	unidentified	0	0	2	1	0	0	1	1	0	0	0	0	2	0	0	2	2	1
Lespedeza procumbens Michx.	bush clover	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Lespedeza virginica L.		1	1	3	5	1	1	2	2	2	3	0	2	4	1	1	2	0	2
Lespedeza intermedia (S. Wats.) Britt.		0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	1	0
Lespedeza capitata Michx.		0	1	0	0	0	0	4	2	2	1	0	3	4	0	0	0	0	0
Lespedeza hirta (L.) Hornem.		0	0	0	0	1	0	0	0	0	1	0	0	4	0	0	0	1	0
Lespedeza sp. Michx.	unidentified	1	0	0	0	1	1	0	0	1	1	0	0	0	2	0	0	0	0
Stylosanthes biflora		0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Clitoria mariana L.	butterfly pea	0	0	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Strophostyles helvola (L.) Ell.	wild bean	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Strophostyles leiosperma (T. & G.) Piper		0	2	0	1	1	0	3	0	0	0	0	1	2	0	1	1	0	2
Amphicarpa bracteata (L.) Fern.	hog peanut	0	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
Galactica volubilis (L.) Britt.	milk pea	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Oxalidaceae																			
Oxalis violacea L.	violet wood sorrel	0	1	0	1	0	0	2	1	1	1	1	1	2	1	1	4	1	0
Oxalis stricta L.	yellow wood sorrel	0	0	0	0	0	0	1	0	1	1	1	1	2	0	1	0	0	0
Geraneaceae																			
Geranium carolinianum L.	cranesbill	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae																			
Crotonopsis elliptica Willd.	rushfoil	0	0	0	0	0	0	1	4	3	0	0	3	0	0	0	0	0	0
Crotonopsis linearis Michx.		0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acalypha gracilens Gray	three-seeded Mercury	0	1	0	0	0	0	0	2	1	0	0	1	3	0	0	0	0	0
Tragia urticifolia Michx.		0	0	0	0	0	0	3	0	3	3	0	1	3	0	2	0	1	0
Euphorbia corollata L.	flowering spurge	1	1	0	0	2	1	3	3	0	1	0	2	0	0	1	2	3	3
Euphorbia dentata Michx.	spurge	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Table 2. (cont.)

		Acidic Soils						Basic Soils											
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Juglandaceae																			
Carya texana Buckl.	black hickory	a	a	a	a	a	a	a	p	p	p	a	p	0	a	a	a	a	a
Corylaceae																			
Ostrya virginiana (Mill.) K. Koch	hop hornbeam	0	0	0	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0
Carpinus caroliniana Walt.	blue beech	0	0	0	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0
Fagaceae																			
Quercus alba L.	white oak	0	0	0	0	a	p	0	0	0	0	0	0	0	0	0	0	0	0
Quercus stellata Wang.	post oak	a	a	p	a	p	p	a	a	0	0	a	a	0	a	a	a	a	a
Quercus prinoides Willd.	dwarf chinquapin oak	0	0	0	0	0	p	0	a	a	a	a	a	a	a	a	a	a	a
Quercus marilandica Muenchh.	blackjack oak	a	a	a	a	0	a	p	p	0	0	0	0	0	0	a	0	0	0
Quercus falcata Michx.	southern red oak	0	0	0	0	a	0	0	0	0	0	a	0	0	0	0	0	0	0
Quercus velutina Lam.	black oak	a	0	0	0	a	a	0	0	0	0	0	0	0	0	0	0	0	0
Quercus rubra L.	northern red oak	0	0	0	0	p	0	p	p	a	a	a	0	p	a	p	a	p	p
Ulmaceae																			
Ulmus alata Michx.	winged elm	0	p	1	a	0	p	p	0	p	p	0	3	p	p	p	p	p	a
Ulmus rubra Muhl.	red elm	0	0	p	0	0	0	0	0	0	0	a	0	0	0	0	0	0	0
Celtis occidentalis L. (possibly *C. laevigata*)	hackberry	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0
Celtis tenuifolia Nutt.	dwarf hackberry	0	0	p	0	0	0	0	0	0	0	0	1	3	p	1	0	0	0
Urticaceae																			
Parietaria pensylvanica Muhl.	pellitory	0	0	2	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Santalaceae																			
Comandra richardsiana	bastard toadflax	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Polygonaceae																			
Eriogonum longifolium Nutt.	umbrella plant	0	1	2	1	0	1	1	4	4	3	0	2	2	0	0	1	1	2
Polygonum convolvulus L.	black bindweed	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Chenopodiaceae																			
Chenopodium album L.	lamb's quarters	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Nyctaginaceae																			
Mirabilis albida (Walt.) Heimerl	four-o'clock	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Portulacaceae																			
Talinum parviflorum Nutt.	rock pink	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Talinum calycinum Engelm.		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Caryophyllaceae																			
Parinychia fastigata (Raf.) Fern.	forked chickweed	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arenaria stricta Michx.	rock sandwort	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Table 2. (cont.)

		Acidic Soils						Basic Soils											
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Anacardaceae																			
Cotinus obovatus Raf.	American smoke tree	0	0	0	0	0	0	0	a	0	p	0	1	p	0	0	p	a	a
Rhus glabra L.	smooth sumac	0	1	0	1	0	p	0	0	1	0	0	3	1	0	0	0	0	0
Rhus aromatica Ait.	fragrant sumac	3	0	2	4	4	0	4	3	4	3	2	2	3	4	4	4	0	4
Rhus copallina L.	winged sumac	0	0	p	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus radicans L.	poison ivy	0	5	2	4	5	1	1	1	3	0	0	1	1	0	2	5	3	0
Aceraceae																			
Acer saccharum Marsh	sugar maple	0	0	0	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0
Rhamnaceae																			
Ceanothus americanus L.	New Jersey tea	1	2	0	0	0	0	2	0	3	1	0	2	0	1	0	0	0	1
Vitaceae																			
Parthenocissus quinquefolia (L.) Planch.	Virginia creeper	0	0	0	0	0	1	0	0	1	0	4	0	2	4	0	5	1	1
Vitis aestivalis Michx.	summer grape	2	1	0	0	2	1	0	1	2	1	1	1	1	1	0	1	1	1
Hypericaceae																			
Hypericum punctatum L.	St. John's-wort	1	0	0	1	0	0	1	3	3	0	0	3	1	0	1	0	0	0
Hypericum spathulatum (Spach) Steud.	shrubby St. John's-wort	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	2	0
Hypericum sphaerocarpum Michx.		0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Ascryum hypericoides L.	St. Andrew's cross	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cistaceae																			
Lechea tenuifolia Michx.	pinweed	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Violaceae																			
Viola triloba Schwein.	three-lobed violet	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Passifloraceae																			
Passiflora lutea L.	passion-flower	0	0	2	0	0	0	1	0	1	1	1	1	1	0	1	1	1	0
Cactaceae																			
Opuntia compressa (Salisb.) Macbr.	prickly pear	0	0	2	1	0	0	0	1	2	1	1	1	2	1	1	0	1	0
Umbelliferae																			
Sanicula gregaria Bicknell	black snakeroot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Taenidia integerrima (L.) Drude	yellow pimpernel	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	4
Cornaceae																			
Cornus florida L.	flowering dogwood	0	0	0	0	p	1	0	0	0	0	0	1	0	0	0	0	0	0
Cornus drummundii Meyer	rough-leaved dogwood	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Ericaceae																			
Vaccinium stamineum L.	deerberry	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. (cont.)

		Acidic Soils						Basic Soils											
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Vaccinium vacillans Torr.	lowbush blueberry	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sapotaceae																			
Bumelia lanuginosa (Michx.) Pers.	gum bumelia	1	0	0	0	0	0	1	p	a	a	0	1	1	0	0	0	p	p
Ebenaceae																			
Diospyros virginiana L.	persimmon	0	0	0	p	0	0	p	p	p	0	3	0	0	0	0	0	0	0
Oleaceae																			
Fraxinus pennsylvanica March	green ash	0	0	0	0	0	0	p	p	p	p	0	p	p	p	0	p	0	0
Fraxinus quadrangulata Michx.	blue ash	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	a	0
Chionanthus virginica L.	fringe tree	0	0	p	p	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Asclepiadaceae																			
Asclepias tuberosa L.	butterfly weed	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Asclepias quadrifolia Jacq.	milkweed	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Asclepias verticillata L.	whorled milkweed	0	1	0	1	0	0	1	1	0	2	0	1	1	0	0	0	0	0
Matelea decipiens (Alex.) Woodson	climbing milkweed	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
Convulvulaceae																			
Ipomoea sp. L.	morning glory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Polemoniaceae																			
Phlox pilosa L.	phlox	1	0	0	0	0	0	3	0	0	0	0	0	0	1	1	2	2	2
Boraginaceae																			
Myosotis virginica (L.) BSP.	scorpion grass	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heliotropium tenellum (Nutt.) Torr.	heliotrope	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Onosmodium subsetosum Mackenz. & Bush	false gromwell	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Lithospermum canescens (Michx.) Lehm.	puccoon	0	0	0	0	0	0	0	1	3	0	1	0	1	1	0	0	2	2
Lithospermum incisum Lehm.	yellow puccoon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Verbenaceae																			
Verbena bracteata Lag. & Rodr.	verbena	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Verbena canadensis (L.) Britt.	rose verbena	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Labiatae																			
Scutellaria ovata Hill	skullcap	0	0	0	1	2	0	2	0	2	1	1	1	2	1	1	0	1	0
Physostegia virginiana (L.) Benth.	false dragonhead	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salvia lyrata L.	lyre-leaved sage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Salvia azurea Lam.	blue sage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
Salvia sp. L.	unidentified	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. (cont.)

		Acidic Soils						Basic Soils											
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Monarda fistulosa L.	wild bergamot	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	3
Satureja arkansana (Nutt.) Briq.	calamint	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Cunila origanoides (L.) Britt.	dittany	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae																			
Physalis virginiana Mill.	ground cherry	0	1	0	0	0	0	1	0	1	1	0	1	1	0	1	4	2	1
Scrophulariaceae																			
Penstemon cobaea Nutt.	beard-tongue	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Penstemon pallidus Small	pale beard-tongue	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	0
Linaria canadensis (L.) Dumort.	blue toadflax	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gerardia flava L.	gerardia	0	1	0	0	0	0	1	1	0	0	0	1	0	0	1	0	1	0
Gerardia tenuifolia Vahl		0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Acanthaceae																			
Ruellia humilis Nutt.	wild petunia	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	2	3
Ruellia strepens L.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ruellia pedunculata Torr.		0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2	1	0
Plantaginaceae																			
Plantago virginica L.	hoary plantain	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubiaceae																			
Galium virgatum Nutt.	bedstraw	1	0	0	0	2	1	0	2	0	0	0	1	0	0	0	0	2	3
Galium aparine L.	cleavers	0	0	5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Galium arkansanum Gray	bedstraw	0	2	0	0	0	0	2	2	0	1	0	0	0	1	1	3	0	0
Galium circaezans Michx.	wild licorice	0	2	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
Galium sp. L.	unidentified	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diodia teres Walt.	rough buttonweed	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0
Houstonia purpurea L.	mountain houstonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Houstonia longifolia Gaery.	bluets	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Houstonia nigricans (Lam.) Fern.	bluets	0	1	0	0	0	0	1	3	1	3	0	2	3	0	1	0	1	1
Houstonia tenuifolia Nuttall.		0	0	0	0	0	0	2	3	4	4	0	3	2	0	0	2	0	0
Caprifoliaceae																			
Lonicera flava Sims	yellow honeysuckle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
Symphoricarpos orbiculatus Moench f. *orbiculatus*	coral berry	0	0	0	0	0	0	0	0	2	2	0	2	2	0	0	1	1	0
Viburnum rufidulum Raf.	southern black haw	2	0	0	0	0	0	2	0	0	0	0	1	1	0	0	0	0	p

Table 2. (cont.)

		Acidic Soils						Basic Soils											
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Campanulaceae																			
Specularia perfoliata (L.) A. DC.	Venus' looking glass	0	1	1	1	1	0	0	0	1	0	0	1	1	0	0	0	0	0
Lobelia inflata L.	Indian tobacco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Compositae																			
Vernonia baldwini Torr.	ironweed	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Eupatorium altissimum L.	tall throughwort	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Kuhnia eupatorioides L.	false boneset	0	2	0	0	0	0	2	1	1	2	0	2	2	1	0	0	3	2
Liatris scabra (Greene) K. Schum.	blazing star	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0
Liatris aspera Michx.		0	0	0	0	2	0	0	2	4	1	0	0	0	0	0	0	3	0
Liatris mucronata DC.		0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0
Liatris cylindracea Michx.		0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	3
Liatris squarrosa (L.) Michx.		0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	1	3
Solidago petiolaris Ait.	goldenrod	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago arguta Ait.	goldenrod	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Solidago nemoralis Ait.	old-field goldenrod	2	0	0	1	2	1	1	2	4	4	0	2	0	0	1	0	1	2
Solidago radula Nutt.	rough goldenrod	0	1	2	1	0	0	1	3	3	0	0	3	1	0	0	0	0	2
Solidago ulmifolia Muhl.	elm-leaf goldenrod	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	3	4	0
Solidago sp. L.	unidentified	0	2	2	0	0	1	2	0	1	0	1	1	1	0	0	0	0	0
Aster anomalus Engel.	aster	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0
Aster drummondii Lindl.	Drummond aster	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Aster patens Ait.	spreading aster	5	3	0	0	0	1	3	1	3	2	0	2	1	1	2	0	3	2
Aster sp. L.	unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
Erigeron annus (L.) Pers.	daisy fleabane	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0
Erigeron strigosus Muhl.	daisy fleabane	0	0	1	1	0	0	0	0	0	0	0	2	1	0	0	0	0	0
Antennaria plantaginifolia (L.) Hook.	pussy's toes	1	0	0	1	1	0	0	0	0	0	0	0	0	3	5	4	3	3
Gnaphalium purpureum L.	purple cudweed	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ambrosia artemisiifolia L.	common ragweed	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Silphium laciniatum L.	compass plant	0	2	0	0	0	0	2	2	1	1	0	0	0	0	1	0	0	1
Rudbeckia hirta L.	black-eyed Susan	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0	2
Echinacea pallida Nutt.	pale-purple coneflower	0	0	0	1	0	0	2	3	2	2	0	2	0	0	1	0	2	3
Helianthus divaricatus L.	sunflower	2	4	3	3	0	1	4	4	5	0	0	3	3	1	4	2	5	5
Helianthus hirsutus Raf.	sunflower	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helianthus maximiliani Schrad.	Maximilian sunflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Verbesina virginica L.	white crown-beard	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Verbesina helianthoides Michx.	crown-beard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Coreopsis lanceolata L.	tickseed coreopsis	0	0	5	5	0	0	1	4	2	1	0	2	1	0	0	0	2	0

Table 2. (cont.)

		Acidic Soils						Basic Soils										
	Plot:	1	2	7	9	17	18	3	4	5	6	8	10	11	12	13	14	15	16
Coreoposis palmata Nutt.	coreopsis	0	0	0	0	0	0	2	0	0	0	0	0	0	1	2	0	2	4
Palafoxia callosa (Nutt.) T. & G.		0	0	0	0	0	0	0	2	0	2	0	0	1	0	0	0	0	0
Senecio obovatus Muhl.	squaw-weed	0	0	0	0	0	0	2	1	2	2	0	1	2	1	1	0	1	3
Krigia dandelion (L.) Nutt.	dwarf dandelion	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Lactuca scariola L.	prickly lettuce	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Table. 3. Summary of woody vegetation at Turkey Mountain. Sap=saplings, LS=large seedlings, SS=small seedlings, IV=importance value.

	TREES				REGENERATION				
	Frequency (% of plots)	Basal Area (m^2)/ha	Density (stems/ha)	IV	Frequency (% of plots)	Sap /ha	LS /ha	SS /ha	IV
Carya texana	94.4	2.37	256	16.62	77.8	267	170	1700	12.1
Juniperus virginiana	44.4	3.14	239	15.28	55.6	139	250	3100	8.2
Quercus stellata	83.3	2.70	159	14.11	50.0	211	360	9400	11.1
Q. prinoides	66.7	1.83	117	10.32	44.4	17	250	3100	4.7
Q. marilandica	44.4	0.81	141	7.75	38.9	425	190	1900	13.0
Pinus echinata	22.2	1.90	33	5.96	5.6	3	0	0	0.5
Quercus rubra	55.6	0.55	46	5.16	44.4	31	190	800	4.4
Q. velutina	16.7	0.60	66	3.88	16.7	83	30	300	3.1
Ulmus alata	50.0	0.34	19	3.71	55.6	44	170	800	5.4
Quercus falcata	11.1	0.68	9	2.21	0.0	0	0	0	0
Cotinus obovatus	22.2	0.11	27	2.07	38.9	33	60	1900	4.0
Quercus alba	11.1	0.43	20	1.99	11.1	14	0	0	1.1
Bumelia lanuginosa	27.8	0.05	12	1.81	27.8	8	60	300	2.3
Fraxinus pennsylvanica	22.2	0.07	11	1.55	44.4	44	170	300	4.5
Sassafras albidum	16.7	0.04	14	1.29	27.8	97	280	2800	5.3
Robinia pseudoacacia	16.7	0.04	13	1.27	22.2	33	0	0	2.3
Diospyros virginiana	11.1	0.05	14	1.04	27.8	22	30	0	2.5
Fraxinus quadrangualata	5.6	0.09	9	0.71	5.6	6	30	300	0.7
Ulmus rubra	11.1	0.04	2	0.69	0.0	0	0	0	0
Juniperus ashei	5.6	0.12	2	0.58	0.0	0	0	0	0
Prunus sp.	5.6	0.01	3	0.38	16.7	6	30	0	1.4
Chionanthus virginiana	5.6	0.01	2	0.35	11.1	36	110	0	1.8
Celtis occidentalis	5.6	0.01	1	0.33	5.6	3	0	10000	2.7
Rhus copallina	5.6	0.003	1	0.31	5.6	0	110	0	0.6
Acer saccharum	5.6	0.002	1	0.31	0.0	0	0	0	0
Ostrya virginiana	5.6	0.002	1	0.31	0.0	0	0	0	0
Amelanchier arborea	0.0	0.00	0	--	16.7	6	60	600	1.6
Cornus drummondii	0.0	0.00	0	--	5.6	3	140	0	0.8
Viburnum rufidulum	0.0	0.00	0	--	11.1	19	80	0	1.4
Carpinus caroliniana	0.0	0.00	0	--	5.6	11	0	0	0.6
Cornus florida	0.0	0.00	0	--	5.6	3	0	0	0.5
Crataegus sp.	0.0	0.00	0	--	5.6	8	0	0	0.6

Table. 3. (continued).

	TREES				REGENERATION				
	Frequency (% of plots)	Basal Area (m^2)/ha	Density (stems/ha)	IV	Frequency (% of plots)	Sap /ha	LS /ha	SS /ha	IV
Rhus glabra	0.0	0.00	0	--	5.6	3	0	0	0.5
Vaccinium sp.	0.0	0.00	0	--	5.6	3	110	300	0.7
Celtis tenuifolia	0.0	0.00	0	--	16.7	3	80	60	1.5

Table 4. Ordination results for Canonical Correspondence Analysis of Turkey Mountain tree, woody shrub/tree regeneration strata, and herbaceous data. Table provides eigenvalues (relative importance of each axis), species environment correlations (strength of relation between species and environment), cumulative percentage of variance of the species data and of the species-environment relation, and weighted correlations between environmental variables and first two ordination axes (see ter Braak 1986).

	Trees		Shrub/Tree Regen. Layers		Groundcover	
	axis 1	axis 2	axis 1	axis 2	axis 1	axis 2
Eigenvalues	0.607	0.410	0.629	0.442	0.319	0.298
Species-environment correlation	0.965	0.880	0.944	0.899	0.969	0.980
Cumulative % variance of						
species data	21.1	35.5	15.4	26.2	11.9	23.1
species-environment data	34.9	58.5	27.4	46.6	21.5	41.5
Correlations of envir. variables						
pH	-0.887	0.137	0.879	0.046	-0.643	-0.555
soil depth	0.638	0.026	-0.511	0.084	0.596	0.532
CEC	-0.516	0.185	0.568	0.648	-0.634	0.164
total bases	-0.627	0.252	0.698	0.490	----	----
% organic carbon	-0.354	0.219	0.422	0.689	----	----
% sand	-0.273	-0.130	0.054	-0.581	0.503	-0.590
elevation	0.246	-0.796	-0.517	0.294	----	----
TRMI (index)	-0.136	0.500	0.620	0.151	----	----
basal area	----	----	----	----	-0.500	0.554
IV for black jack oak	----	----	----	----	0.821	0.168
IV for black hickory	----	----	----	----	0.353	0.567
IV for chinquapin oak	----	----	----	----	-0.212	-0.422

Table 5. Presettlement vegetation of upland sites in the vicinity of Turkey Mountain, based on Government Land Office survey notes, 1829, 1830, and 1845. Names of species are given as they appeared in the notes.

A. Frequency of witness trees (N=202)

Species	%	Mean diameter (inches)
white oak	24.8	16.3
post oak	24.3	15.8
black oak	20.3	16.0
hickory	10.9	8.6
pine	10.4	15.1
black gum	3.0	16.2
cedar	2.5	11.2
elm	2.0	12.8
ash	1.0	9.0
dogwood	0.5	9.0
chinquapin	0.5	16.0

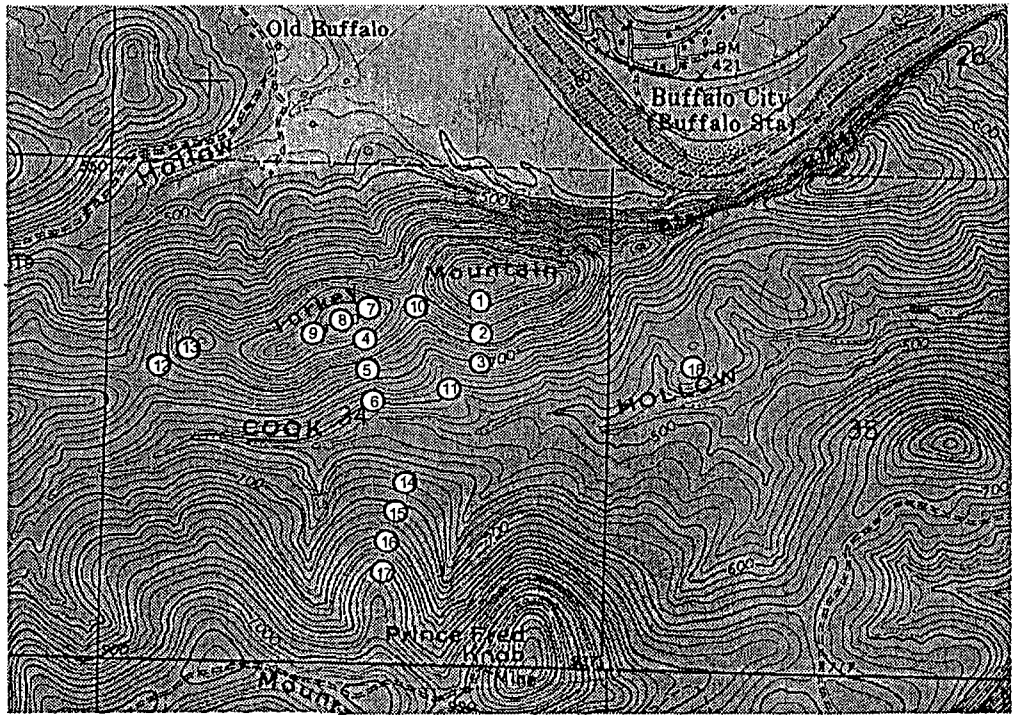
B. Occurrence from line descriptions

Upland Timber (N=54)	% of lines mentioned	% of lines mentioned 1st	weighted % occurrence
oak	100.0	68.5	48.7
hickory	68.5	20.3	26.1
pine	57.4	11.1	20.2
cedar	13.0	0.0	3.1
blackgum	7.4	0.0	1.2
elm	3.7	0.0	0.7
Upland Understory (N=55)			
oak or oak brush	98.2	78.2	49.3
hickory	32.7	20.0	15.4
briers	30.9	0.0	10.7
pine	34.5	0.0	4.9
dogwood	29.1	0.0	4.9
sassafras	7.3	0.0	2.6
plum	7.3	0.0	2.3
chinquapin	7.3	0.0	2.3
cedar	3.6	1.8	1.6
sumac	7.3	0.0	1.6

Table 5 (cont.)

Upland Understory (continued)

	% of lines mentioned	% of lines mentioned 1st	weighted % occurrence
grape	5.4	0.0	1.3
redbud	3.6	0.0	1.3
black locust	1.8	0.0	0.7
pawpaw	1.8	0.0	0.7
blackgum	3.6	0.0	0.3
elm	1.8	0.0	0.3
"bushes"	1.8	0.0	0.3
"vines"	1.8	0.0	0.2



Plot Locations on Turkey Mountain

Figure 1. Approximate plot locations on Turkey Mountain (see Appendix 5 for a more complete description).

Figure 2. Diversity (Shannon-Weaver Index) of plots on Turkey Mountain in relation to environmental variables. Plots are positioned in CCA ordination space (see Fig. 6A). Size of circles is proportional to diversity. Species richness results are almost identical.

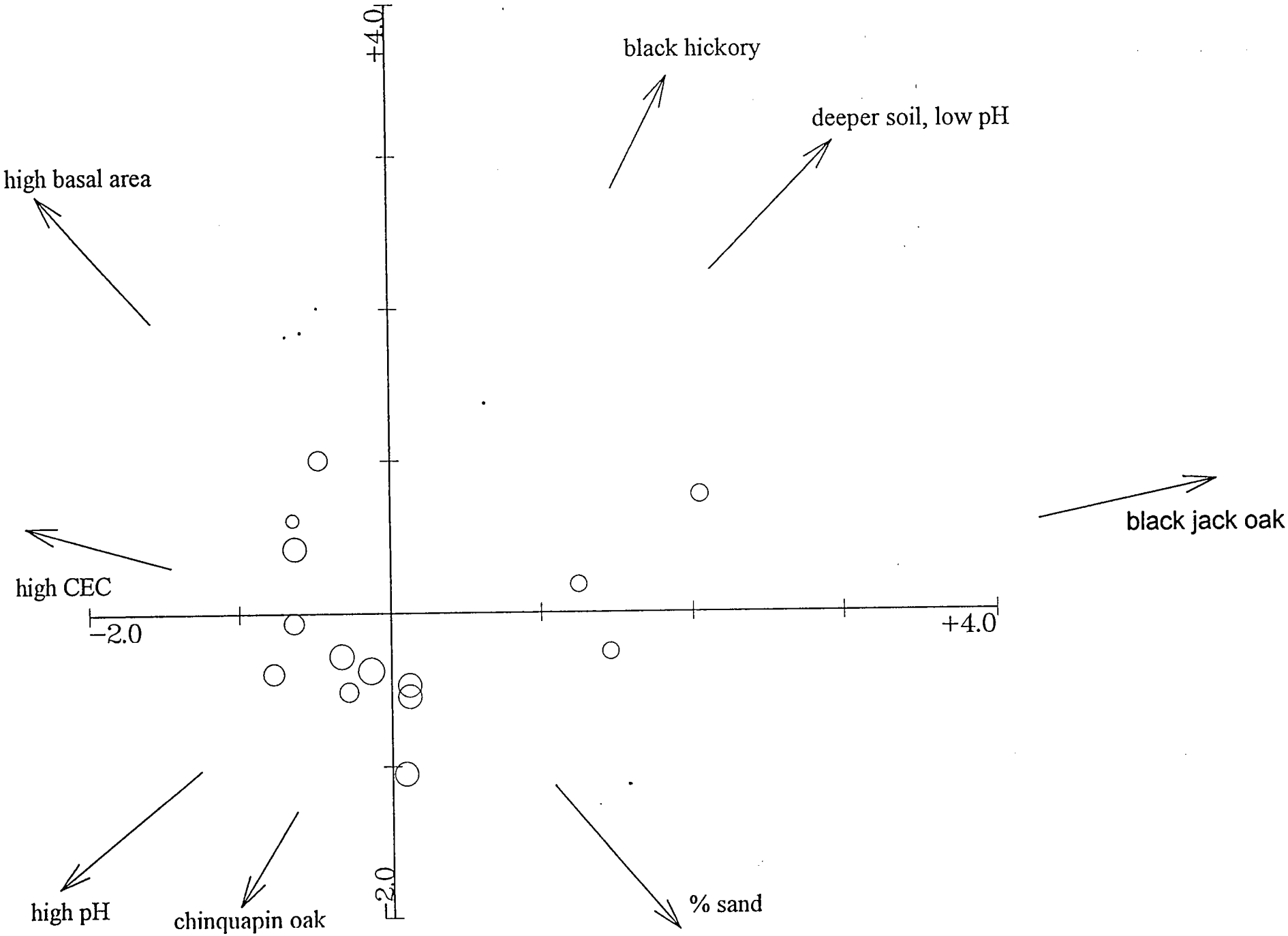

+4.0
black hickory
deeper soil, low pH
high basal area
black jack oak
high CEC
−2.0
+4.0
−2.0
high pH
chinquapin oak
% sand

Figure 3. Age class distribution of trees on Turkey Mountain.

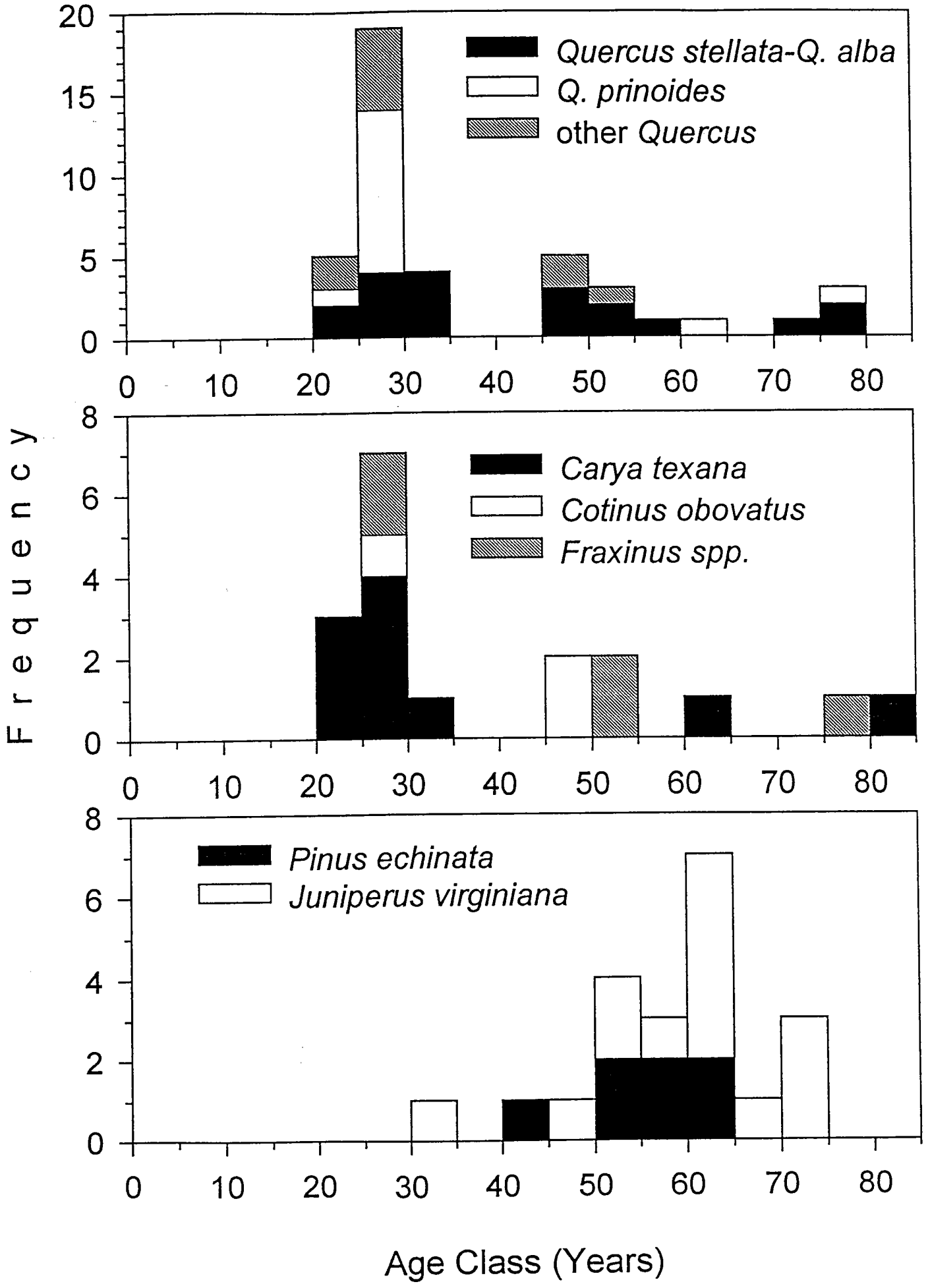

Quercus stellata-Q. alba
Q. prinoides
other Quercus
Carya texana
Cotinus obovatus
Fraxinus spp.
Pinus echinata
Juniperus virginiana
Frequency
Age Class (Years)
0
5
10
15
20
0
2
4
6
8
0
10
20
30
40
50
60
70
80

Figure 4. CCA ordination triplot of tree and tall shrub species (≥5 cm dbh) on Turkey Mountain. The environmental vectors point in the direction of maximum correlation and vector length is proportional to the strength of the correlation. Numbers represent plots, and species codes include the first 3 letters of the genus and species (see Tables 1 and 2). Indicator species will appear in the vicinity of a particular plot or at the ends of environmental gradients. Tolerant species appear in the middle.

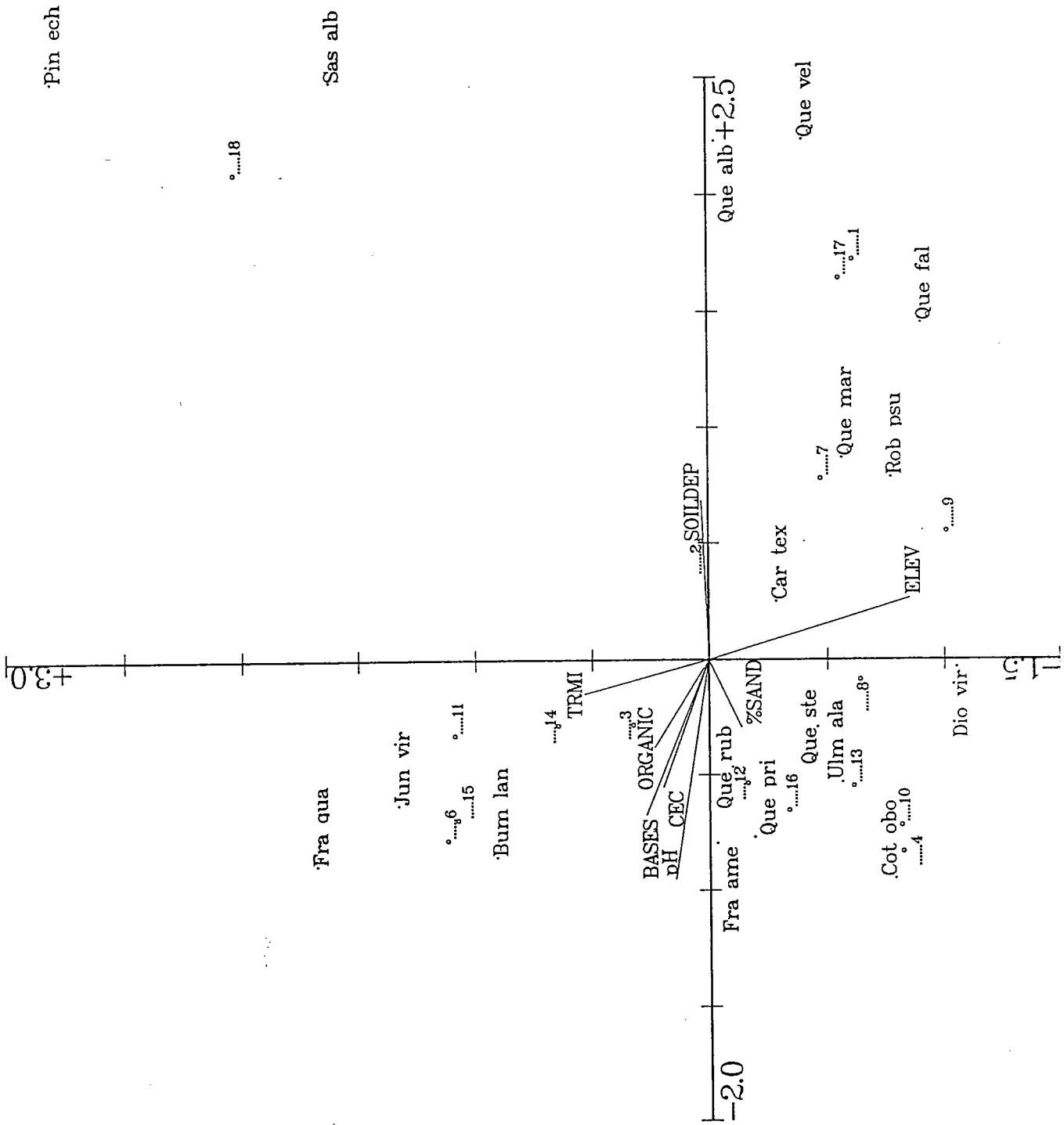

Pin ech
Sas alb
Que alb
Que vel
Que fal
Que mar
Rob psu
Car tex
ELEV
SOILDEP
TRMI
ORGANIC
BASES
pH
CEC
%SAND
Que rub
Fra ame
Que pri
Que ste
Ulm ala
Cot obo
Dio vir
Fra qua
Jun vir
Bum lan
+2.5
-2.0
+3.0
-1.5

Figure 5. CCA ordination triplot of woody understory species (≥5 cm dbh) on Turkey Mountain. The environmental vectors point in the direction of maximum correlation and vector length is proportional to the strength of the correlation. Numbers represent plots and species codes include the first 3 letters of the genus and species (see Tables 1 and 2). Indicator species will appear in the vicinity of a particular plot or at the ends of environmental gradients. Tolerant species appear in the middle.

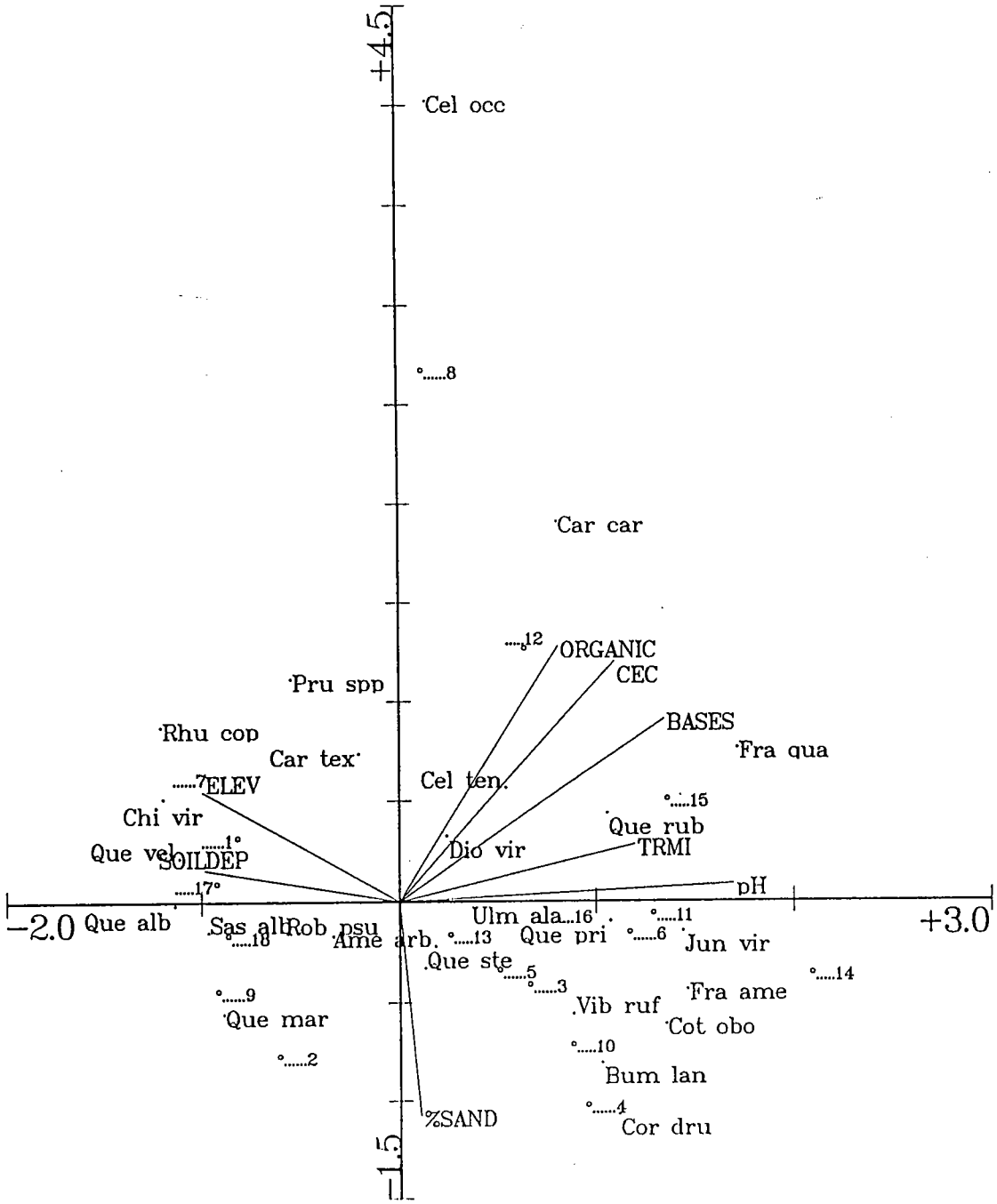

+4.5
-1.5
-2.0
+3.0
Cel occ
Car car
ORGANIC
CEC
BASES
Fra qua
Pru spp
Rhu cop
Car tex
Cel ten.
ELEV
Chi vir
Que vel
SOILDEP
Dio vir
TRMI
Que rub
pH
Que alb
Sas alb
Rob psu
Ame arb.
Ulm ala
Que pri
Que ste
Jun vir
Fra ame
Vib ruf
Cot obo
Que mar
Bum lan
Cor dru
%SAND
8
12
7
15
1
17
16
11
18
13
6
5
3
14
9
10
2
4

Figure 6. CCA ordination of plots (A) and groundcover species (B and C). Fig. 6C is zoomed-in on the origin, where not all species were labeled in Fig. 6B. The environmental vectors point in the direction of maximum correlation and vector length is proportional to the strength of the correlation. Numbers represent plots, and species codes include the first 3 letters of the genus and species (see Tables 1 and 2). Indicator species will appear in the vicinity of a particular plot or at the "ends" of environmental gradients. Tolerant species appear in the middle.

Fig. 6A (ordination of groundcover plots)

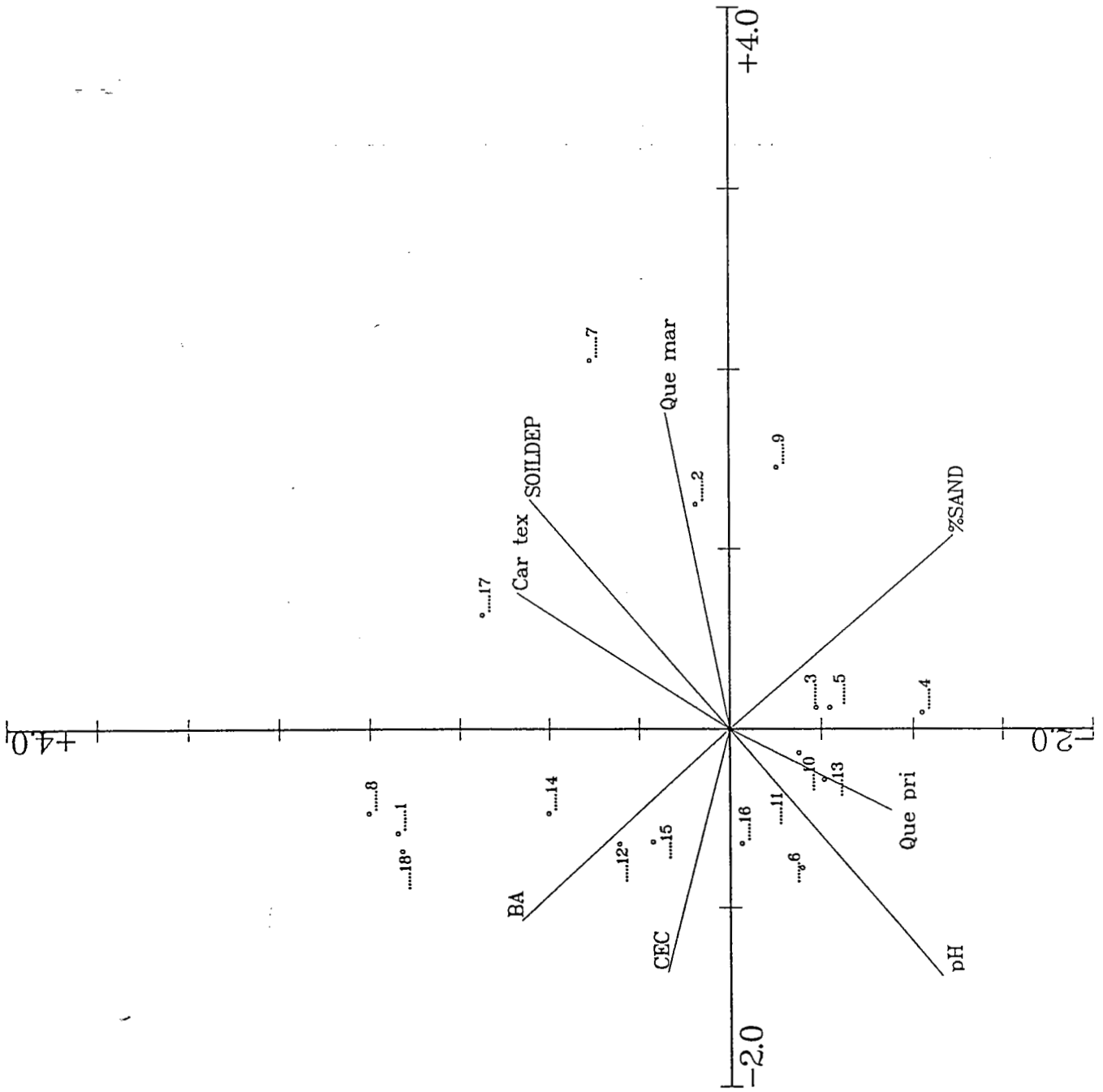


Fig. 6B (ordination of groundcover species)

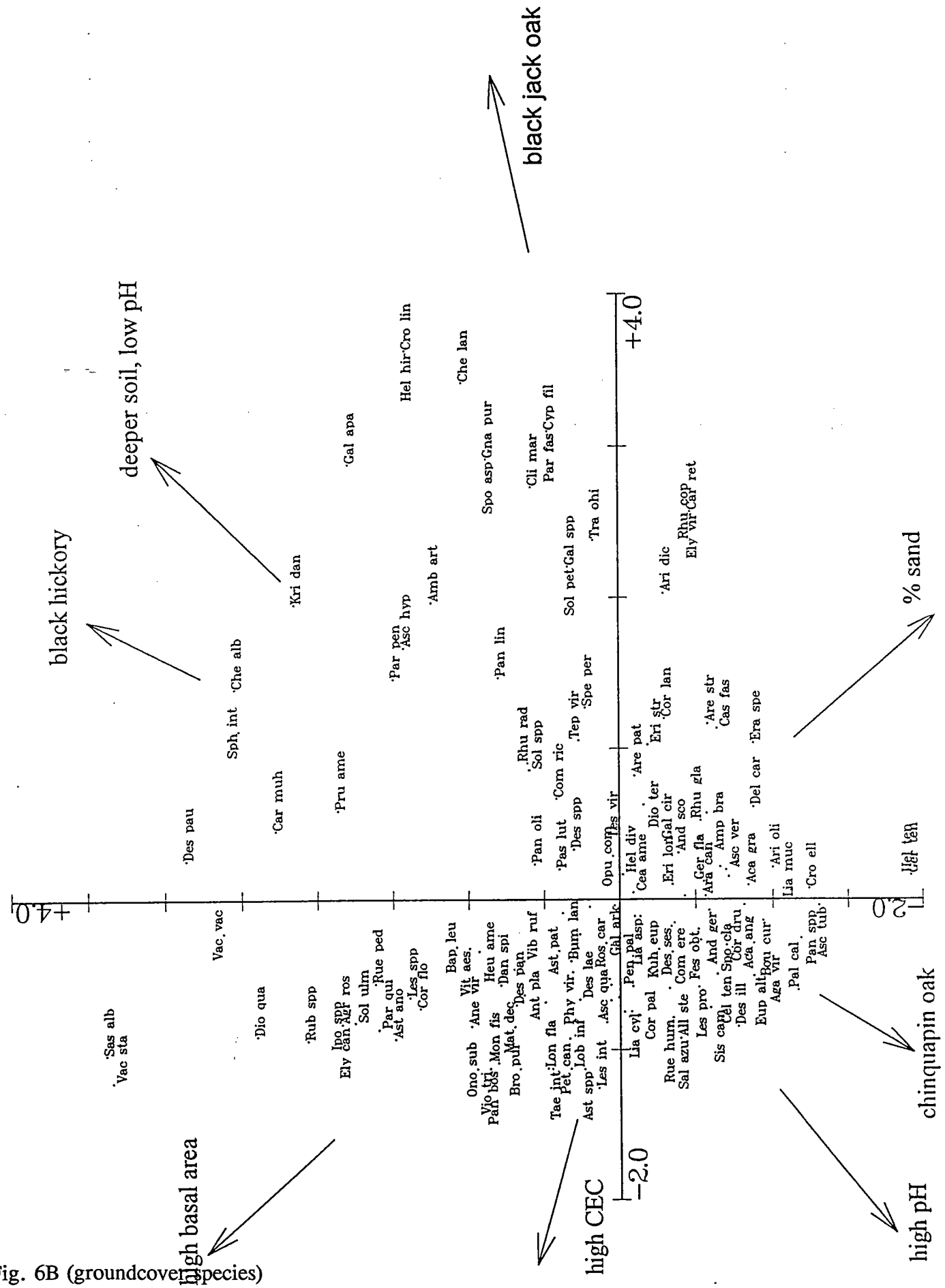
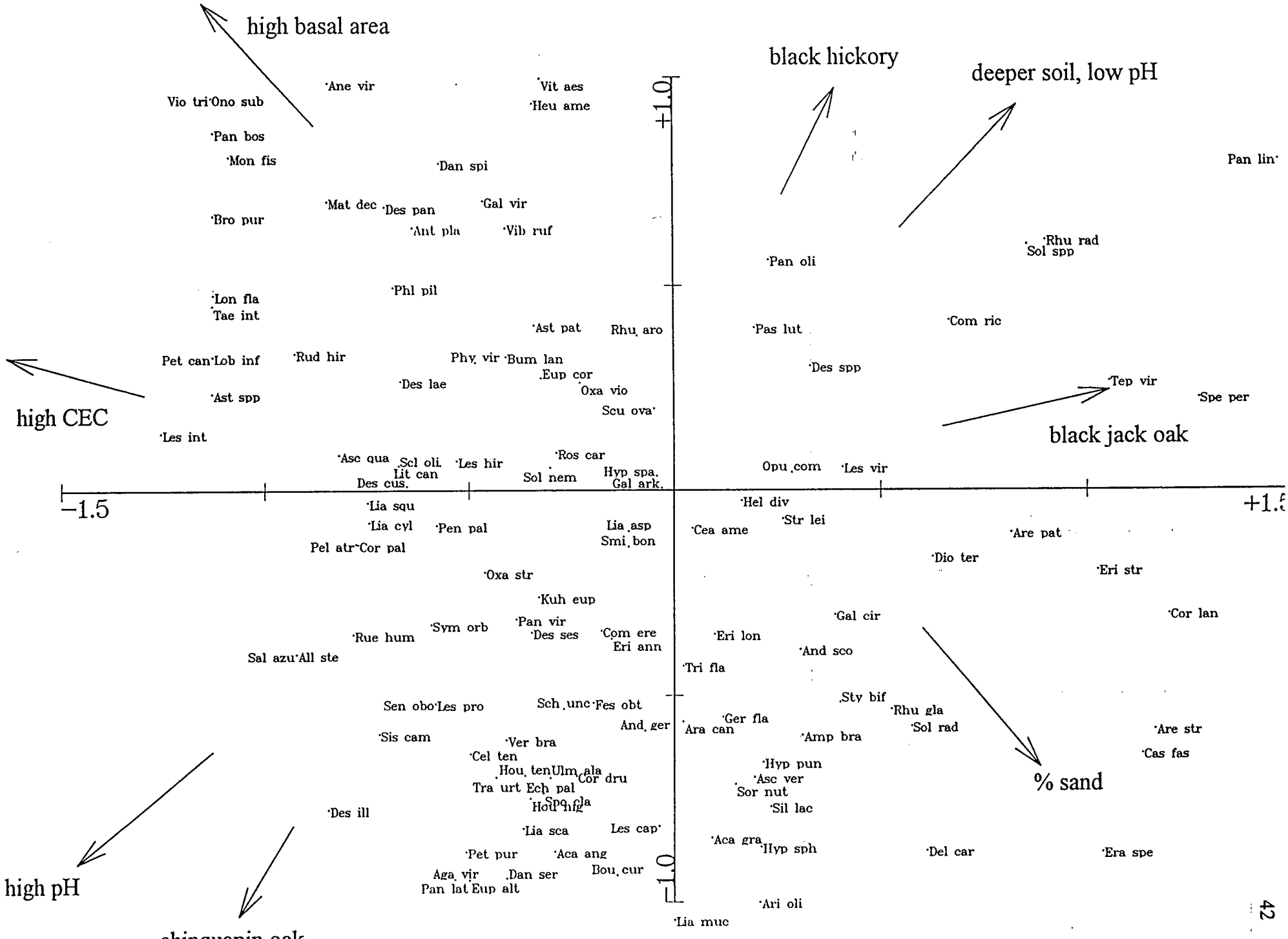


Fig. 6B (groundcover species)

Fig. 6C (ordination of grc lcover species-zoomed in)



Appendix 1. Density (stems/ha) of trees and tall shrubs at Turkey Mountain, Ozark National Scenic Riverways, Arkansas.

	plots in acid soils							plots in basic soils													
Species	1	2	7	9	17	18	mean	3	4	5	6	8	10	11	12	13	14	15	16	mean
Carya texana	440	520	540	300	100	180	347	160	20	40	40	700	120	0	260	200	720	180	80	210
Pinus echinata	40	0	20	0	0	540	100	0	0	0	0	0	0	0	0	0	0	0	20	2
Quercus alba	0	0	0	0	320	40	60	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. marilandica	360	680	500	620	0	120	380	100	20	0	0	0	0	0	0	140	0	0	0	87
Q. stellata	160	460	80	400	40	40	197	420	180	0	0	40	20	0	260	640	20	40	60	140
Q. velutina	680	0	0	0	320	180	197	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. rubra	0	0	0	0	60	0	10	60	0	100	40	240	0	0	180	60	40	20	20	63
Q. prinoides	0	0	40	0	0	0	7	0	260	540	160	380	60	60	160	60	120	120	140	172
Q. falcata	0	0	0	0	100	0	17	0	0	0	0	60	0	0	0	0	0	0	0	5
Sassafras albidum	60	0	0	0	40	160	43	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus rubra	0	0	20	0	0	0	3	0	0	0	0	20	0	0	0	0	0	0	0	2
U. alata	0	20	0	80	0	0	17	20	0	20	0	0	40	0	20	0	60	20	60	20
Cotinus obovatus	0	0	0	0	0	0	0	0	140	0	0	0	60	0	0	0	0	80	200	40
Fraxinus quad.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	0	13
F. pennsylvanica	0	0	0	0	0	0	0	0	20	80	0	0	20	60	0	0	20	0	0	17
Bumelia lanuginosa	0	0	0	0	0	0	0	0	0	40	100	0	0	40	0	0	0	20	20	18
Juniperus ashei	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	3
J. virginiana	0	0	20	60	0	0	13	0	0	60	1200	0	0	1780	0	0	380	740	60	352
Chionanthus virg.	0	0	40	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus copallina	0	0	20	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Robinia pseudo.	0	0	200	0	0	0	33	0	0	0	0	20	0	0	0	20	0	0	0	3
Celtis tenifolia	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	2
Diospyros virg.	0	0	0	20	0	0	3	0	0	0	0	240	0	0	0	0	0	0	0	20
Prunus sp.	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	5
Acer saccharum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	2
Ostrya virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	2

Appendix 2. Basal area (m^2/ha) of trees and tall shrubs at Turkey Mountain and Prince Freds Knob, Ozark National Scenic Riverways, Arkansas.

	plots in acid soils							plots in basic soils												
Species	1	2	7	9	17	18	mean	3	4	5	6	8	10	11	12	13	14	15	16	mean
Carya texana	5.23	3.95	3.56	1.07	5.46	0.76	3.34	0.86	0.07	0.09	0.31	5.89	0.93	0.00	1.74	1.16	8.46	1.64	1.58	1.89
Pinus echinata	0.66	0.00	0.04	0.00	0.00	32.83	5.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.06
Quercus alba	0.00	0.00	0.00	0.00	7.53	0.14	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q. marilandica	4.31	3.84	3.31	1.96	0.00	0.72	2.36	0.33	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.08
Q. stellata	3.89	1.69	0.59	1.55	0.30	0.13	1.36	9.98	0.99	0.00	0.00	0.81	1.43	0.00	8.99	9.65	0.67	3.27	4.70	3.37
Q. velutina	7.10	0.00	0.00	0.00	2.80	0.88	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q. rubra	0.00	0.00	0.00	0.00	0.17	0.00	0.03	0.21	0.00	1.28	0.55	1.80	0.00	0.00	3.94	0.21	1.10	0.51	0.09	0.81
Q. prinoides	0.00	0.00	0.19	0.00	0.00	0.00	0.03	0.00	1.35	3.22	4.04	3.22	1.16	1.69	3.11	0.55	4.82	3.70	5.87	2.73
Q. falcata	0.00	0.00	0.00	0.00	9.64	0.00	1.61	0.00	0.00	0.00	0.00	2.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
Sassafras albidum	0.14	0.00	0.00	0.00	0.13	0.49	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ulmus rubra	0.00	0.00	0.06	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
U. alata	0.00	0.08	0.00	0.51	0.00	0.00	0.10	0.07	0.00	0.24	0.00	0.00	0.15	0.00	0.26	0.00	0.27	0.12	4.46	0.46
Cotinus obovatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.69	0.66	0.17
Fraxinus quad.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58	0.00	0.13
F. pennsylvanica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.30	0.00	0.00	0.00	0.45	0.00	0.00	0.27	0.00	0.00	0.10
Bumelia lanug.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.32	0.00	0.00	0.19	0.00	0.00	0.00	0.10	0.04	0.08
Juniperus ashei	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.18
J. virginiana	0.00	0.00	0.06	1.73	0.00	0.00	0.90	0.00	0.00	1.67	15.00	0.00	0.00	20.61	0.00	0.00	5.93	10.97	0.50	4.56
Chionanthus virg.	0.00	0.00	0.11	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rhus copallina	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Robinia pseudo.	0.00	0.00	0.66	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.01
Celtis tenuifolia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Diospyros virg.	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
Prunus sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Acer saccharum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.003
Ostrya virginiana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.003
TOTAL	21.3	9.6	8.6	6.9	26.0	36.0	18.1	11.5	3.1	7.1	20.2	16.2	3.9	25.1	18.1	12.2	21.5	22.6	18.6	15.0

Appendix 3. Importance values (IV) of trees and tall shrubs at Turkey Mountain, Ozark National Scenic Riverways, Arkansas.
IV= [(relative basal area + relative density)/2]*100.

	plots in acid soils							plots in basic soils												
Species	1	2	7	9	17	18	mean	3	4	5	6	8	10	11	12	13	14	15	16	mean
Carya texana	24.9	36.1	38.8	17.9	15.6	8.2	23.6	14.3	2.6	2.9	2.1	37.8	30.9	0.0	18.9	13.7	46.1	10.1	10.3	15.8
Pinus echinata	2.7	0.0	0.9	0.0	0.0	67.1	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.3
Quercus alba	0.0	0.0	0.0	0.0	30.8	1.8	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q. marilandica	20.4	40.3	36.1	35.2	0.0	5.8	23.0	8.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	1.6
Q. stellata	13.7	22.5	6.1	24.8	2.6	1.8	12.5	71.2	30.2	0.0	0.0	3.6	21.7	0.0	38.9	68.1	2.3	8.7	17.2	21.8
Q. velutina	36.2	0.0	0.0	0.0	21.7	8.4	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q. rubra	0.0	0.0	0.0	0.0	3.4	0.0	0.6	4.9	0.0	14.7	2.7	12.3	0.0	0.0	20.7	3.6	4.0	1.9	1.7	5.5
Q. prinoides	0.0	0.0	2.5	0.0	0.0	0.0	0.4	0.0	42.4	53.5	15.2	20.6	24.4	4.9	17.3	4.9	15.6	12.5	26.3	19.8
Q. falcata	0.0	0.0	0.0	0.0	23.6	0.0	3.9	0.0	0.0	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Sassafras albidum	2.0	0.0	0.0	0.0	2.3	7.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ulmus rubra	0.0	0.0	1.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
U. alata	0.0	1.0	0.0	6.4	0.0	0.0	1.2	1.6	0.0	2.8	0.0	0.0	8.2	0.0	1.8	0.0	2.8	1.0	16.5	2.9
Cotinus obovatus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.1	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	4.4	16.9	4.4
Fraxinus quad.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3	0.0	0.8
F. pennsylvanica	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	6.7	0.0	0.0	3.7	2.4	0.0	0.0	1.4	0.0	0.0	1.4
Bumelia lanug.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	4.0	0.0	0.0	1.4	0.0	0.0	0.0	0.9	1.6	1.0
Juniperus ashei	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.4
J. virginiana	0.0	0.0	1.0	14.6	0.0	0.0	2.6	0.0	0.0	15.2	76.1	0.0	0.0	86.0	0.0	0.0	27.8	51.1	5.9	21.8
Chionanthus virg.	0.0	0.0	2.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhus copallina	0.0	0.0	1.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Robinia pseudo.	0.0	0.0	10.5	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.2
Celtis tenuifolia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Diospyros virg.	0.0	0.0	0.0	1.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Prunus sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Acer saccharum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.1
Ostrya virginiana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.1

Appendix 4. Density (number/100 m^2) of saplings (Sp), large seedlings (Ls), and small seedlings (ss) by plot. PART I. ACIDIC SOILS

Plot:	1			2			7			9			17			18		
Species	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss
Carya texana	8	5	50	4	5	50	4	0	0	1	0	0	4	0	100	2	0	0
Pinus echinata	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quercus alba	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	1	0	0
Q. marilandica	5	0	0	35	10	250	13	5	50	20	20	0	0	0	0	1.5	0	0
Q. stellata	2.5	5	0	2	0	50	1.5	5	0	11.5	0	0	0	0	0	1.5	0	0
Q. velutina	5	5	0	0	0	0	0	0	0	0	0	0	9	0	0	1	0	50
Q. rubra	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5	0	0	0	0
Q. prinoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5	0
Sassafras albidum	9	0	100	3	10	200	0	0	50	0	0	0	2.5	0	0	3	35	150
Ulmus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U. alata	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
Cotinus obovatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus quadrangulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. pennsylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bumelia lanuginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniperus ashei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0.5	15	0
Chionanthus virginiana	0	0	0	0	0	0	4.5	20	0	2	0	0	0	0	0	0	0	0
Rhus copallina	0	0	0	0	0	0	4.5	20	0	0	0	0	0	0	0	0	0	0
Robinia pseudoacacia	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Celtis tenuifolia	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
Diospyros virginiana	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Prunus sp.	0.5	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acer saccharum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostrya virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amelanchier arborea	0.5	5	50	0.5	0	50	0	0	0	0	0	0	0	0	0	0	0	0
Cornus drummondii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum rufidulum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpinus caroliniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cornus florida	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
Crataegus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus glabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
Vaccinium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	50

Appendix 4. Density (number/100 m^2) of saplings (Sp), large seedlings (Ls), and small seedlings (ss) by plot. PART II. BASIC SOILS

Species	Plot: 3			4			5			6			8			10		
	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss
Carya texana	4.5	0	0	0	0	0	3	10	50	0.5	5	0	9	0	0	0	0	0
Pinus echinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quercus alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. marilandica	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. stellata	16	50	1100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. velutina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. rubra	0	0	0	1	0	0	0	0	50	0	5	0	0	0	0	0	0	0
Q. prinoides	0	0	0	0.5	0	0	1	0	0	0	20	0	0	0	0	0	0	50
Sassafras albidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U. alata	3.5	10	0	0	0	0	0	5	0	0	0	50	0	0	0	0	0	0
Cotinus obovatus	0	0	0	0	5	0	0	0	0	0.5	0	0	0	0	0	4	0	0
Fraxinus quadrangulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. pennsylvanica	0.5	0	0	2	0	0	1.5	0	0	0	5	0	0	0	0	1.5	5	0
Bumelia lanuginosa	0.5	0	0	1.5	5	0	0.5	0	0	0	0	0	0	0	0	0	5	0
Juniperus ashei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. virginiana	1.5	0	50	0	0	0	1.5	0	0	10	5	0	0	0	0	0	0	0
Chionanthus virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus copallina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Robinia pseudoacacia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Celtis tenuifolia	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1800	0	0	0
Diospyros virginiana	1	0	0	0.5	0	0	0.5	5	0	0	0	0	1	0	0	0	0	0
Prunus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
Acer saccharum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostrya virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amelanchier arborea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cornus drummondii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	25	0
Viburnum rufidulum	3.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpinus caroliniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cornus florida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crataegus sp.	0	0	0	0	0	0	1.5	0	0	0	0	0	0	0	0	0	0	0
Rhus glabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaccinium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 4. Density (number/100 m^2) of saplings (Sp), large seedlings (Ls), and small seedlings (ss) by plot. PART II. BASIC SOILS (continued)

Plot:	11			12			13			14			15			16		
Species	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss	Sp	Ls	ss
Carya texana	0	0	0	3	5	50	2.5	0	0	0.5	0	0	0	0	0	1	0	0
Pinus echinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quercus alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. marilandica	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0
Q. stellata	0	0	0	0.5	5	250	3	0	500	0	0	0	0	0	0	1	0	50
Q. velutina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q. rubra	0	0	50	2.5	10	50	0	0	0	1	5	0	0	0	0	1	10	0
Q. prinoides	0.5	10	150	0.5	0	50	0	0	0	0	0	0	0	0	0	0	10	50
Sassafras albidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulmus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U. alata	0.5	0	0	1	5	0	1.5	10	0	0	0	100	0.5	5	0	0	0	0
Cotinus obovatus	0.5	0	0	0	0	0	0	0	0	0.5	5	0	0	0	350	0.5	0	0
Fraxinus quadrangulata	0	0	0	0	0	0	0	0	0	0	0	0	1	5	50	0	0	0
F. pennsylvanica	0.5	5	0	1.5	0	0	0	0	0	0.5	20	50	0	0	0	0	0	0
Bumelia lanuginosa	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0
Juniperus ashei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. virginiana	8.5	15	0	0.5	0	0	0	0	0	2	5	250	1	0	200	0	0	50
Chionanthus virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus copallina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Robinia pseudoacacia	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0.5	0	0
Celtis sp.	0	15	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diospyros virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acer saccharum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostrya virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amelanchier arborea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
Cornus drummondii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum rufidulum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Carpinus caroliniana	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cornus florida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crataegus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhus glabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaccinium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 5. Plot locations and descriptions for Turkey Mountain, Arkansas. PFK is Prince Freds Knob; PO=post oak; BJO=black jack oak; CO=chinquapin oak; SLP=shortleaf pine; BH=black hickory; NRO=northern red oak; ERC=eastern red cedar; WA=white ash; WE=winged elm; SRO=southern red oak; WO=white oak; PER=persimmon.

Plot 1

LOCATION: shoulder slope of largest Knob of Turkey Mt., 10 m below crest of knob.
ELEVATION: 1020 ft.
GPS POSITION: 36 09. 6660 N
092 26. 8340 W
LANDMARKS: 172° to PFK, 194° to 1st knob of Granite Mt., 185° to gap between PFK and Granite Mt.

CORNER DESCRIPTIONS (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BJO	39.0 cm	11.5 m	288	
	BO	19.3, 14.0	6.5	340	coppice
NE	PO	27.6	4.3	347	
	BO	12.2, 5.0	5.1	30	coppice
SW	BJO	20.0	4.6	227	
	SLP	40.2	7.2	193	
SE	BJO	31.5	10.7	08	
	PO	36.0	9.1	65	

SLOPE POSITION: upper
SLOPE CONFIGURATION: straight
SLOPE ASPECT: 150°
SLOPE STEEPNESS: 22°
TRMI INDEX: 5+5+6+3= 19 (out of 60 maximum=most mesic)

Plot 2

LOCATION: middle slope of largest knob of Turkey Mt.
ELEVATION: 830 ft.
GPS POSITION: 36 09. 5745 N
092 26. 9162 W
LANDMARKS: 170° to PFK, 185° to gap between PFK and 1st knob of Granite Mt., 195° to 1st knob of Granite Mt.

CORNER DESCRIPTIONS (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BJO	13.7 cm	3.2 m	03	
	PO	31.7	3.2	237	
NE	PO	30.7	13.0	80	
	PO	31.5	8.6	94	
SW	BH	22.4	6.3	347	
	PO	24.1	8.3	116	
SE	PO	22.0	3.9	194	
	BH	26.0	2.2	216	

SLOPE POSITION: middle

SLOPE CONFIGURATION: convex
SLOPE ASPECT: 176°
SLOPE STEEPNESS: 26°
TRMI: 10+0+3+2=15

Plot 3

LOCATION: lower slope of largest knob of Turkey Mt., 100 m below plot 2
ELEVATION: 660 ft.
GPS POSITION: 36 09. 5111N
092 26. 9194W
COORDINATES: 185° to gap between PFK and 1st knob Granite Mt., 196° to 1st knob of Granite Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	PO	45.8 cm	11.0 m	293	
	PO	29.9	5.8	242	
NE	BJO	14.4	8.7	32	
	BH	12.4	3.4	96	
SW	PO	22.6	4.1	252	
	PO	28.0	2.8	178	
SE	PO	26.5	9.6	175	
	PO	32.3	6.8	230	

SLOPE POSITION: lower
SLOPE CONFIGURATION: convex/straight
SLOPE ASPECT: 179°
SLOPE STEEPNESS: 18°
TRMI: 15+2+3+4=24

Plot 4

LOCATION: at base of cliff of 2nd highest knob on Turkey Mt., plot directly below large cleft in cliff face on east end of sandstone cap (plot 4 is below and 25 m over from plot 7).
ELEVATION: 860 ft.
GPS POSITION: 36 09. 5770N
092 27. 1722W
LANDMARKS: 150° to PFK, 164° to center of gap between PFK and 1st knob of Granite Mt., 174° to 1st knob of Granite Mt., 202° to 2nd knob of Granite Mt.
CORNER DESCRIPTIONS

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BJO	10.0 cm	6.4 m	306	coppice, 3 stems < 10.0 cm dbh
	ERC	24.2	4.3	264	
NE	BJO	44.0	2.2	346	
	CO	34.1	5.2	25	
SW	CO	37.5	5.2	211	
	PO	30.5	12.0	267	
SE	WA	23.0	6.7	68	
	CO	28.0	5.3	230	

SLOPE POSITION: upper
SLOPE CONFIGURATION: concave/straight
SLOPE ASPECT: 170°
SLOPE STEEPNESS: 20°
TRMI: 5+8+4+4=21

Plot 5

LOCATION: on 2nd highest knob of Turkey Mt., 100 m (at a bearing of 160°) below plot 4.
ELEVATION: 700 ft.
GPS POSITION: 36 09. 5083N
092 27. 1307W
LANDMARKS: 150° to PFK, 165° to center of gap between PFK and 1st knob of Granite Mt., 177° to 1st knob of Granite Mt., 208° to 2nd knob of Granite Mt..

CORNER DESCRIPTIONS (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BM	10.4 cm	2.7 m	190	
	NRO	15.1	4.0	270	coppice 2 stems < 10 cm dbh
NE	BH	17.2	6.6	36	
	CO	30.9	13.5	80	
SW	ERC	24.4	6.8	282	
	BH	21.0	1.2	202	
SE	PO	16.9	4.1	105	
	CO	22.0, 17.8	10.6	54	coppice, forked

SLOPE POSITION: middle
SLOPE CONFIGURATION: convex/straight
SLOPE ASPECT: 175°
SLOPE STEEPNESS: 19°
TRMI: 10+2+3+4=19

Plot 6

LOCATION: 100 m below (at a bearing of 160°) plot 5
ELEVATION: 605 ft.
GPS POSITION: 36 09. 4357N
092 27. 0095W
LANDMARKS: 150° to PFK, 178° to 1st knob of Granite Mt., 210° to 2nd k of GM.

CORNER DESCRIPTIONS (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	ERC	19.7 cm	3.8 m	330	
	CO	24.3	7.5	291	
NE	WE	10.2	17.9	326	
	ERC	20.5	2.4	70	
SW	BH	19.8	1.5	241	
	ERC	19.3	3.6	153	
SE	ERC	24.5	8.2	18	
	BH	21.0	4.2	87	

SLOPE POSITION: lower

SLOPE CONFIGURATION: straight
SLOPE ASPECT: 185°
SLOPE STEEPNESS: 19°
TRMI: 15+5+2+4=26

Plot 7

LOCATION: on the east point of sandstone cap of 2nd highest knob of Turkey Mt.
ELEVATION: 903 ft.
GPS POSITION: 36 09. 5748N
092 27. 0858W
LANDMARKS: 150° to PFK, 70° to Buttcheek Bluff (above plot 10).

CORNER DESCRIPTIONS (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BH	15.0 cm	3.9 m	354	
	WO	52.5	10.8	227	tree half gone (fire)
NE	BH	21.8	12.9	324	
	BJO	11.7	5.3	15	
SW	BH	12.2	2.7	148	
	NRO	37.2, 44.0	9.0	210	coppice
SE	SLP	14.9	0.4	175	
	SLP	12.8	4.8	250	

SLOPE POSITION: ridge top
SLOPE CONFIGURATION: convex/straight
SLOPE ASPECT: 115°
SLOPE STEEPNESS: 8°
TRMI: 0+2+10+8=20

Plot 8

LOCATION: on summit of 2nd highest knob of Turkey Mt., 50 m (at a bearing of 235°) from plot 7
ELEVATION: 990 ft.
GPS POSITION: 36 09.5845N
092 27.2191W
LANDMARKS: 147° to PFK, 170° to 1st knob of Granite Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BH	30.4 cm	8.2 m	264	
	BH	34.8	12.7	300	
NE	NRO	44.2	6.6	314	
	BH	14.0	1.7	76	
SW	PER	8.5	0.2	202	
	BH	39.5	12.3	297	
SE	PO	30.8	11.7	180	
	PO	30.1	4.7	08	

SLOPE POSITION: ridge top
SLOPE CONFIGURATION: convex/straight

SLOPE ASPECT: 82°
SLOPE STEEPNESS: 8°
TRMI: 0+2+13+8=23

Plot 9

LOCATION: at west end of sandstone cap of 2nd highest knob of Turkey Mt., 50 m from plot 8 at a bearing of 23°
ELEVATION: 930 ft.
GPS POSITION: 36 09.5822N
092 27.2681W
LANDMARKS: 145° to PFK, 168° to 1st knob of Granite Mt., 194° to 2nd knob of Granite Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	NRO	11.5 cm	0.7 m	00	
	PO	16.9	2.7	24	
NE	BJO	16.9	2.7	345	
	PO	18.2	4.1	78	
SW	SLP	40.5	9.0	170	
	ERC	12.5	7.5	205	
SE	PO	22.0	8.0	108	
	PO	15.8	3.8	89	

SLOPE POSITION: ridge top
SLOPE CONFIGURATION: convex
SLOPE ASPECT: 230°
SLOPE STEEPNESS: 4°
TRMI: 0+0+3+9=11

Plot 10

LOCATION: in saddle between 1st and 2nd highest knobs Of Turkey Mt.
ELEVATION: 876 ft.
GPS POSITION: 36 09.6391N
092 27.0108W
LANDMARKS: 162° to top of PFK, 175° to gap between PFK and 1st knob of Granite Mt., 185 ° to 1st knob of Granite Mt., 67° to Buttcheek Bluff of highest knob on Turkey Mt.; 50 to 60 m upslope at 252° to plot 7.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	PO	41.9 cm	3.1 m	263	
	BH	14.1	3.8	321	
NE	CO	14.6	32.0	110	
	BH	24.8	10.3	169	
SW	NRO	24.6, 9.0	13.5	235	coppice
	PO	13.5	7.0	169	
SE	WA	21.5	7.2	106	
	BH	28.9	8.9	224	

SLOPE POSITION: upper slope
SLOPE CONFIGURATION: convex
SLOPE ASPECT: 115°
SLOPE STEEPNESS: 8°
TRMI: 5+0+10+8=23

Plot 11

LOCATION: on toe slope at base of ravine between the 1st and 2nd highest knob of Turkey Mt.
ELEVATION: 569 ft.
GPS POSITION: 36 09.4709N
092 27.0150W
LANDMARKS: 142° to PFK, 185° to top of 1st knob of Granite Mt., 176° to gap between PFK and 1st knob of Granite Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	CO	30.0 cm	4.3 m	316	
	ERC	12.4	1.3	279	
NE	BJO	32.0	6.6	336	
	ERC	13.9	1.6	23	
SW	ERC	14.9	6.8	74	
	ERC	23.7	9.6	103	
SE	ERC	20.5	2.8	15	
	ERC	24.0	1.2	135	

SLOPE POSITION: lower slope
SLOPE CONFIGURATION: straight
SLOPE ASPECT: 125°
SLOPE STEEPNESS: 11°
TRMI: 15+5+9+7=36

Plot 12

LOCATION: 75 m from large post oak on east side of saddle trail
ELEVATION: 819 ft.
GPS POSITION: 36 09.5859N
092 27.5935W
LANDMARKS: 297° to Crystal Point, 285° to 2nd point on Warrior Mt., 276° to 3rd point of Warrior Mt., 270° to 4th point of Warrior Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	CO	31.9 cm	7.1 m	280	
	CO	23.2	7.7	325	
NE	BH	29.8	3.1	144	
	BH	31.5	6.3	349	
SW	PO	16.0	7.7	182	
	CO	27.3	2.5	115	
SE	PO	28.8	7.4	65	
	PO	37.4	3.5	111	

SLOPE POSITION: upper slope
SLOPE CONFIGURATION: straight
SLOPE ASPECT: 290°
SLOPE STEEPNESS: 21°
TRMI: 5+5+10+3=23

Plot 13

LOCATION: 50 m upslope from plot 12 at a bearing of 90°
ELEVATION: 864 ft.
GPS POSITION: 36 09.5754N
092 27.5612W
LANDMARKS: 293° to Crystal Point; 285° to 2nd point, 276° to 3rd point, 270° to 4th point of Warrior Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	PO	24.7 cm	9.5 m	32	
	PO	9.5	2.5	261	
NE	PO	39.4	1.8	54	
	BH	21.0	4.2	134	
SW	WA	54.2	8.5	95	
	PO	27.7, 36.2	7.2	150	coppice
SE	PO	32.7, 12.2	6.3	73	coppice
	BH	22.2	2.5	155	

SLOPE POSITION: upper slope
SLOPE CONFIGURATION: convex/straight
SLOPE ASPECT: 242°
SLOPE STEEPNESS: 20°
TRMI: 5+2+4+4=15

Plot 14

LOCATION: 100 m below plot 15 at a bearing of 340°
ELEVATION: 645 ft.
GPS POSITION: 36 09.3511N
092 27.1572W
LANDMARKS: 341° to highest point of second knob of Turkey Mt., 320° to pine tree on 3rd knob to west, 20° to highest knob of Turkey Mt., 12° to lowest point of saddle between knob 1 and 2 of Turkey Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	ERC	34.0 cm	7.3 m	335	
	CO	24.2, 19.0	9.1	290	forked bole
NE	ERC	19.0	7.1	91	
	PO	28.1	10.5	124	
SW	ERC	22.6	11.0	303	
	PO	17.0	10.8	280	
SE	NRO	44.0	10.4	175	
	CO	49.0	11.2	210	

SLOPE POSITION: lower
SLOPE CONFIGURATION: straight
SLOPE ASPECT: 20°
SLOPE STEEPNESS: 12°
TRMI: 15+5+20+6=46

Plot 15

LOCATION: 100 m below plot 16 at a bearing 340°
ELEVATION: 714 ft.
GPS POSITION: 36 09.2447N
092 27.1574W
LANDMARKS: 340° to sentinel pine on west bluff of 2nd Knob of Turkey Mt., 20° to highest pint of 1st knob (highest knob) of Turkey Mt., 300° to 3rd knob of Turkey Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	ERC	22.4 cm	2.5 m	282	
	ERC	18.5	5.0	203	
NE	ERC	16.4	1.6	350	
	CO	41.9	8.6	265	
SW	PO	17.3	3.2	163	
	ERC	27.5	7.0	122	
SE	ERC	18.6	11.1	106	
	CO	17.3	3.8	172	

SLOPE POSITION: middle
SLOPE CONFIGURATION: convex/straight
SLOPE ASPECT: 325°
SLOPE STEEPNESS: 12°
TRMI: 10+2+14+6=32

Plot 16

LOCATION: 100 m below plot 17 at a bearing of 340°
ELEVATION: 822 ft.
GPS POSITION: 36 09.2709N
092 27.1399W
LANDMARKS: 342° to sentinel pine on west bluff of 2nd knob of Turkey Mt., 333° to highest point of 3rd knob of Turkey Mt., 17° to highest point of 1st knob of Turkey Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	BH	19.8 cm	5.0 m	292	
	BH	25.2, 21.1	6.3	190	coppice
NE	ERC	13.5	7.8	24	
	SRO	39.2	10.6	153	
SW	PO	31.7	10.0	212	
	PO	46.9	8.0	145	
SE	BH	14.0	1.4	123	
	PO	25.7, 16.5	5.4	162	coppice

SLOPE POSITION: upper slope
SLOPE CONFIGURATION: convex/straight
SLOPE ASPECT: 331°
SLOPE STEEPNESS: 18°
TRMI: 5+2+14+4=25

Plot 17

LOCATION: on flat summit of small knob between PFK and Granite Mt.
ELEVATION: 945 ft.
GPS POSITION: 36 09.1261N
092 27.1337W
LANDMARKS: 343° to sentinel pine on west bluff of 2nd knob of Turkey Mt., 14° to highest point of 1st knob of Turkey Mt., 8° to Buttcheek Bluff on 1st knob of Turkey Mt.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	SRO	26.9 cm	4.8 m	357	
	SLP	45.4	12.1	270	
NE	BO	46.6	5.7	03	
	BJO	29.6	4.9	93	
SW	SRO	66.0	2.6	256	
	BH	30.0	9.2	203	
SE	SRO	50.7	6.9	105	
	WO	53.6	14.9	110	

SLOPE POSITION: ridge top
SLOPE CONFIGURATION: straight
SLOPE ASPECT: 349°
SLOPE STEEPNESS: 4°
TRMI: 0+5+16+9=30

Plot 18

LOCATION: bench above Cook Hollow
ELEVATION: 510 ft
GPS POSITION: 36 09.5047N
092 27.5064W
LANDMARKS: 208° to PFK, 101° to knob near river.

CORNER DESCRIPTION (WITNESS TREES)

CORNER	SP	DBH	DISTANCE	BEARING (°)	REMARKS
NW	SLP	13.9 cm	3.0 m	360	
	SLP	11.4	1.7	300	
NE	SLP	25.5	4.0	90	
	BO	34.9	5.9	330	
SW	SLP	34.0	1.8	90	
	SLP	33.8	1.5	160	fire scar
SE	BO	41.6	3.0	200	
	SLP	11.3	0.7	90	

SLOPE POSITION: lower slope

SLOPE CONFIGURATION: straight
SLOPE ASPECT: 163°
SLOPE STEEPNESS: 24°
TRMI: 15+5+4+2=26